

# Network



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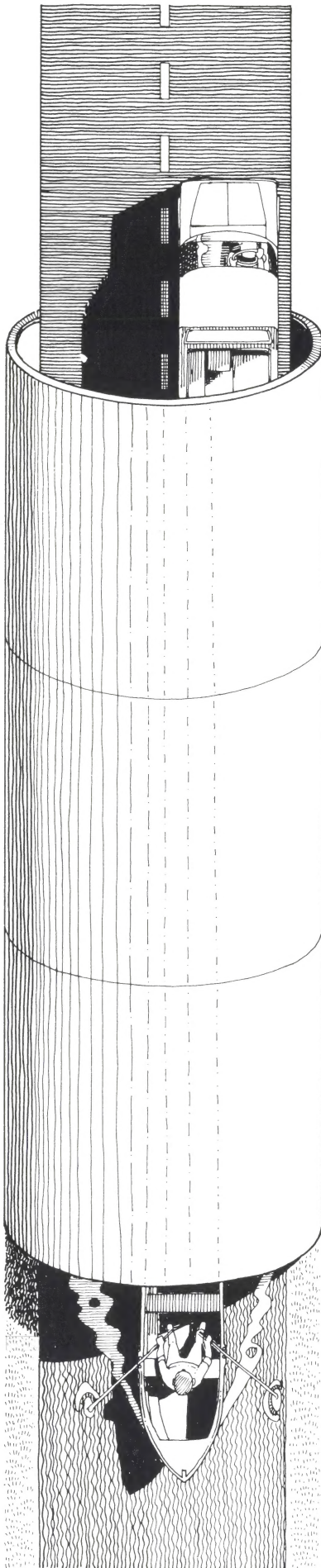
## Railways of Australia Quarterly

Volume 21, No. 4

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CENWAG into the computer age (page 6)  
Hunter Valley gets help from SRA (page 10)  
STORE '84 - Perth and Pilbara (page 30)  
Head hardened rails... a BHP report (page 51)



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# Network

## Railways of Australia Quarterly

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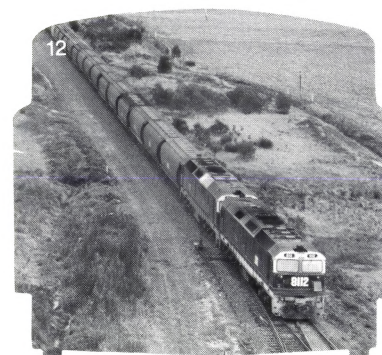
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Railways of Australia Committee



V/Line



State Rail Authority of NSW



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# Contents

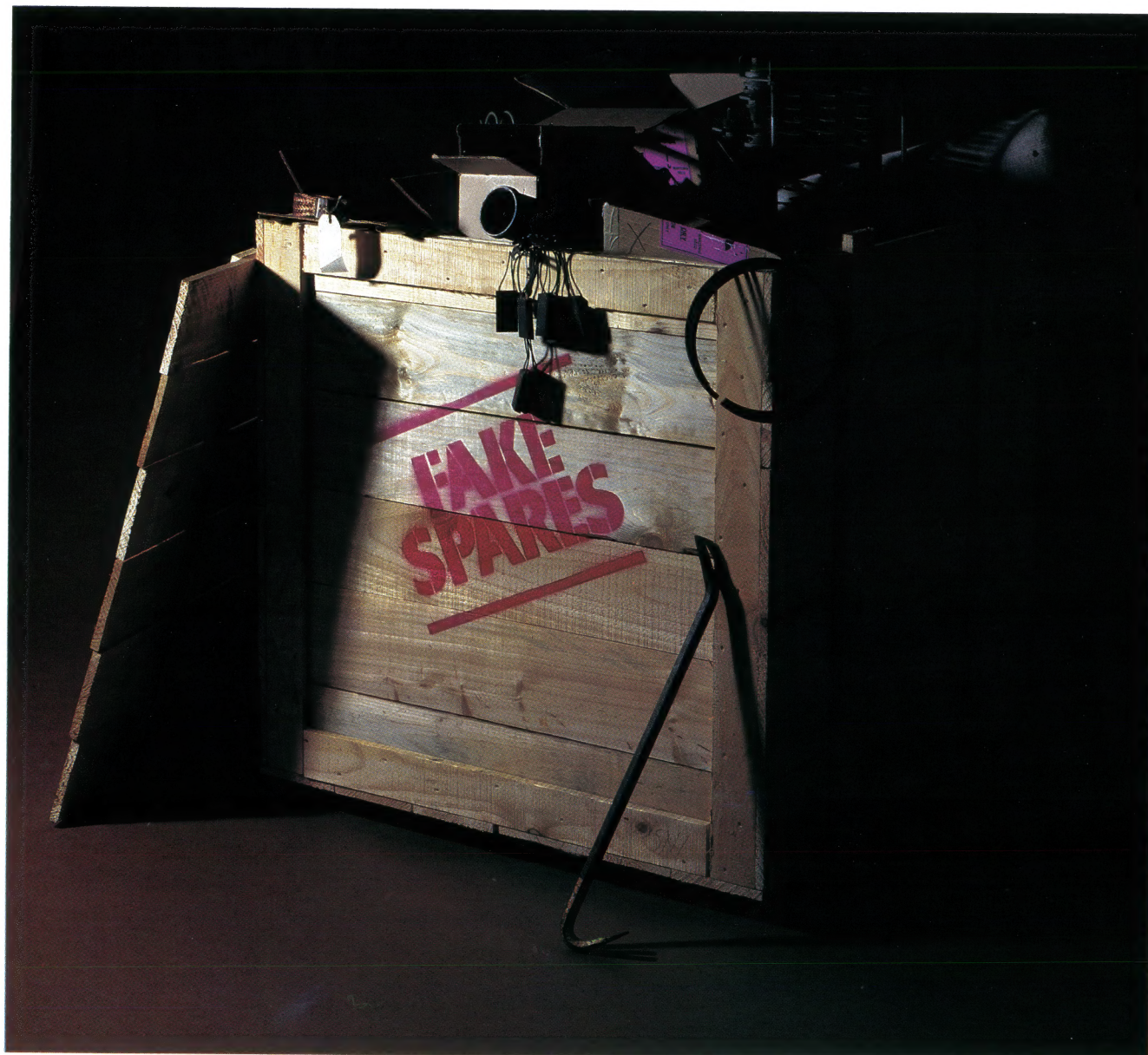
	page
Executive Director's column	5
CENWAG into the computer age	6
V/Line goes 'strong' on freight	9
Hunter Valley gets help from SRA	10
Westrail staff involved in strategy	14
QR gets energy into perspective	16
V/Line boosts results	19
Budd SPV-2000	22
Lal Lal School given old rail clock	24
\$160m ASER project	26
"Mortuary" gets new lease of life	28
New ROAC Chairman	29
STORE '84-Focus on Perth and Pilbara	30
Dudley Street Bakery	38
New commercial role for the workshops	39
The Alpine debate	42
Train Ferries (Part II)	44
Bookshelf	48
V/Line timber cutters	50
Head hardened rails	51
Facing competition	55
Window Seat	59
V/Line reveals South-West	62

### Front cover:

*Four 2680 kW diesels and a locotrol wagon at the Port Hedland depot, Mount Newman Railway. (See STORE '84 report this issue)*

*Our only requirement of writers and personalities who contribute to Network is that they be informative or entertaining and that their subject has relevance to the wide interests of railwaymen today. Naturally, there will be occasions when their viewpoints or opinions run contrary to those of the editor or to Railways of Australia. We must accept that these differences are among the elements essential to the presentation of a lively and interesting magazine.*

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# The EXECUTIVE DIRECTOR'S column

## *A time for review...*

October is a significant month in the calendar of Railways of Australia. Traditionally, the Chief Executives of all Australian and New Zealand Government Railway Systems meet for their Annual Conference. Now titled the Australian and New Zealand Railways Conference, the gathering had its antecedents in 1898 when the Chief Commissioners for Railways of New South Wales and Victoria met and agreed that the holding of periodical conferences between Commissioners, twice yearly, "would be very beneficial".

So, in 1899, the gathering was referred to as the "Railway Commissioners' Intercolonial Conference." By 1900 with the addition of the New Zealand representative, the gathering was called "The Conference of the Commissioners of State Railways in Australasia".

The subjects discussed at that stage were both technical and managerial in nature. They included such things as the effectiveness of electrical lighting in railway carriages, the problem of disposing of ashes from steam locomotives, whether sleepers were more durable if they were piled under particular climatic conditions, and the desirability of gradually eliminating the practice of using open wagons for the carriage of excursion traffics at times of peak demand.

Earlier meetings in 1895 between Victoria and New South Wales addressed the problem of the very competitive rates offered by Victoria for traffic from the New South Wales Riverina region. The Victorian Railways at that time used a tariff which discriminated against goods of Victorian origin by offering cheap rates to goods which came from New South Wales - thereby attracting trade away from Sydney. This practice was reflected in the final Australian Constitution which provided for the creation of an Interstate Commission. That body would have specific powers to review discriminatory freight rates to ensure that fairness prevailed.

It is interesting to note that after a brief period of existence in the first two decades of this century, the Interstate Commission has only now been recently re-created. Such, then, were our origins. In 1975, the creation of Railways of Australia Committee heralded an era of increasing attention towards a co-ordinated approach for intersystem freight and passenger traffic. Obviously, the needs were directed at Australia itself - and it is only annually that New Zealand takes part at Commissioner level. Officers from the New Zealand Rail Authority attend engineering meetings and meetings of industrial officers for exchange of views on matters of mutual interest. In keeping with modern management techniques, the Annual Commissioners' Conference now occupies less time of these top chief executives. Much of the material which formerly was discussed is now handled by a separate series of committees, each with a particular purpose.

Where five independent Systems each with their own guiding political philosophy meet to reach consensus, the task is never an easy one. The fact that complex matters can be resolved by discussion, compromise, and consensus is a tribute to the sound management practices adopted by our Systems in Australia. Each is imbued with one common goal - that of serving the Australian freight and passenger public well.

The Railways of Australia Committee's staff will continue to ensure that those policies are adhered to.

*Michael Schrader*

M. C. G. SCHRADER  
EXECUTIVE DIRECTOR



M. C. G. Schrader

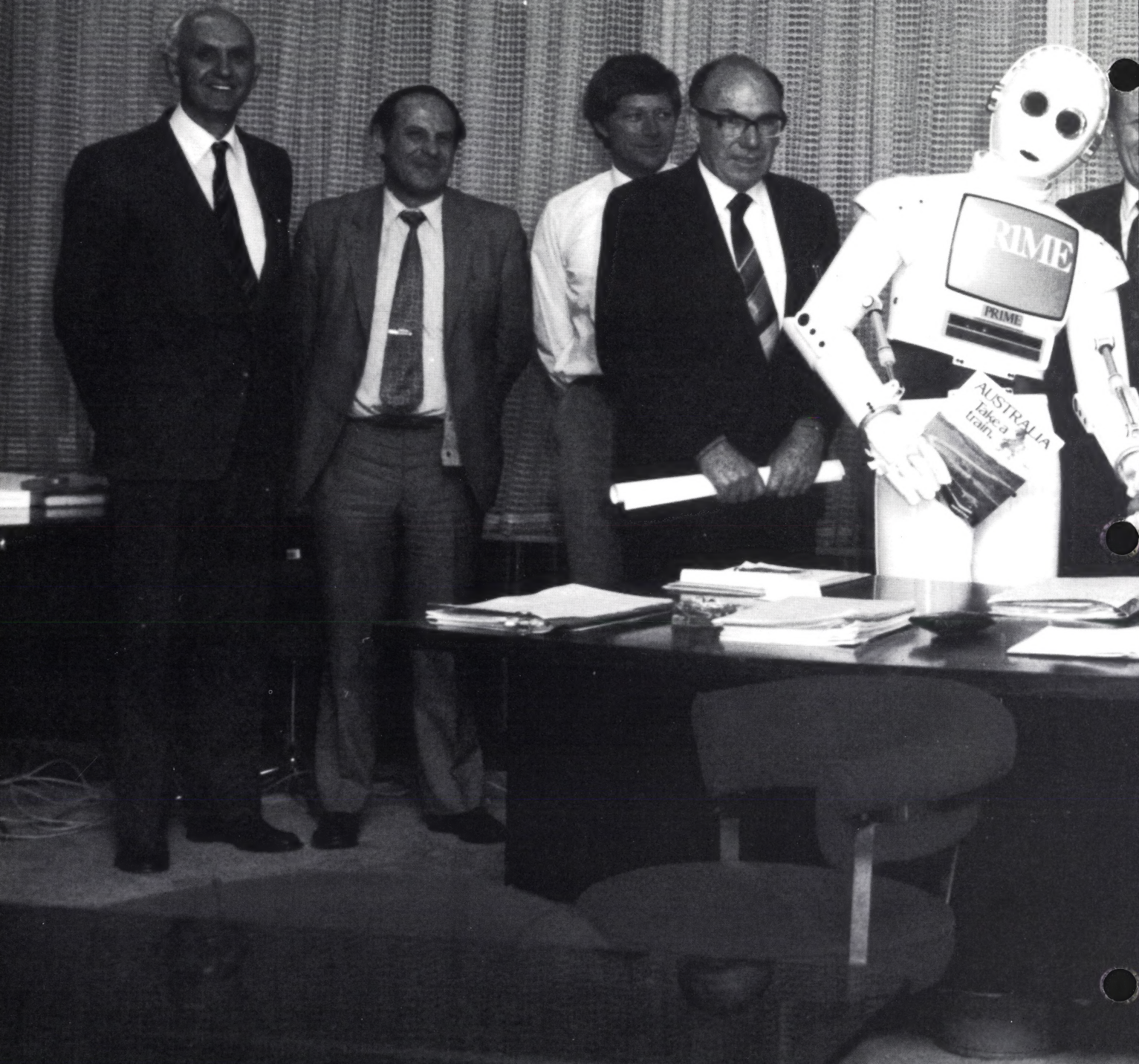
# CENWAG takes up 'ARMS'

Railways of Australia have opened yet another chapter of progress with the acquisition and development of a sophisticated computer system for CENWAG operations.

The new computer system, now identified by the acronym ARMS (Australian Railways Monitoring System), will run on a PRIME 2250 office environment machine with a capacity of 1 Mb memory and 80 Mb of disc storage.

ARMS was developed by Primary Software Services Pty Ltd of Melbourne to meet the unique requirements of Railways of Australia, which involve the collection and evaluation of large volumes of data relating to inter-system freight movements. CENWAG's new EDP capacity, scheduled to be commissioned early in 1985, will replace present manual processes and so provide the means of monitoring more

comprehensively inter-system freight movements on all traffic corridors. ARMS will become the tool to enhance the efficiency of CENWAG and, as a consequence, improve the inter-system freight transport efforts of all Australian rail systems. ARMS differs from most systems in that it has no manual data entry element, but collects its information from direct entry standard railway telex messages



# to enter computer age

currently used as a method of communication between stations, marshalling yards and head offices.

CENWAG's unique requirements called for a unique solution. This was provided by Primary Software Services incorporating several pseudo intelligence techniques to enable interpretation of free format telex messages. An advanced pattern recognition technique is used to break down these telex

messages into component parts. Place name recognition was another area which required some imaginative design by the contractor.

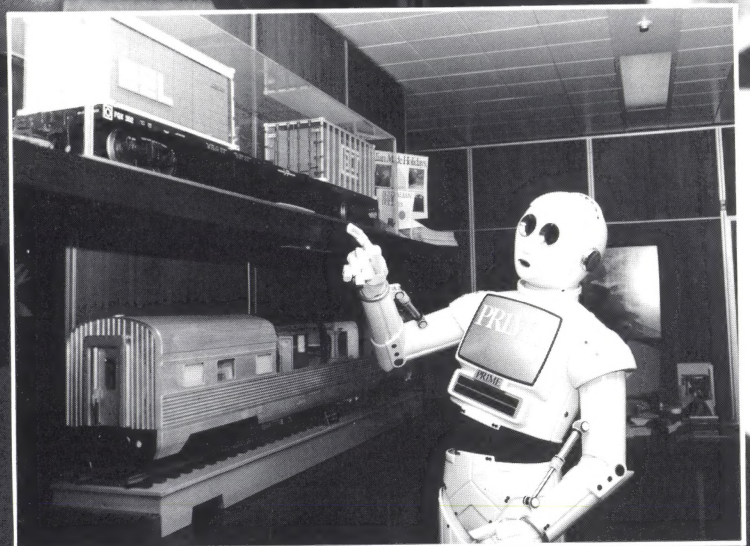
The ARMS project is being co-ordinated by a committee of railway EDP officers, chaired by ROA's Assistant Director (Intersystem Traffic Control), Mr S. (Siggi) Johr, and responsible to the ROA Management Committee. Mr Johr told NETWORK that the

project is proceeding on schedule. When commissioned, the system will reveal the total dimensions of CENWAG's potential. Railways of Australia efforts to further improve intersystem traffic performance will be strengthened by the success of the ARMS project and will ensure increased rail client satisfaction.



*Main picture: Prime Computer figurehead Albert Ein-Prime is introduced to the Executive Director of the Railways of Australia Committee, Mr. M.C.G. Schrader, and members of the ROA management committee.*

*Right: the Prime robot checks out the display models in the foyer of the ROA offices.*



# The clip



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# V/Line talks freight with 'Strong Line'

A extensive campaign promoting V/Line as the State's major freight organisation has recently been launched by the Freight Services Division.

The aim of this 'Strong Line' program has been to publicise to both existing and potential customers that V/Line has developed and is continuing to develop a more efficient freight service.

An equally important aspect of this drive has been to make employees aware of the importance of their attitude in developing this improved service. "Staff involvement and attitude is an essential ingredient in building a better V/Line," says General Manager Freight Services Division, Stan Beevor.

The program is a continuation of a previous theme indicating that the organisation as a whole is following a new line of thinking involving increased market orientation. It also confirms the consolidation that has taken place in the newly-created Freight Services Division over the last 18 months, time spent in critical analysis of the Division's services, staff, markets and customers. Consequently it was now felt appropriate to take a stronger line in promoting V/Line's bulk freight and parcels services and the newly created Freightgates.

In 1983/84 V/Line's freight revenue was \$162 million and a target of \$200 million has been set for this financial year.

To help achieve this goal a comprehensive campaign has been planned involving press advertisements, brochures, a film, a staff educational program and involvement at major agricultural shows and exhibitions.

The 'Strong Line' campaign was spearheaded by the screening of a film featuring V/Line's full range of freight services. It demonstrates the current capacity, potential, and above all, strength of V/Line Freight and emphasises the diversity of these operations.

The traditional role of Divisional managers has fundamentally changed, in accordance with the increased market orientation within V/Line. Specialist freight marketing groups have been constructed to identify the trends and needs of today and tomorrow's market place,

and, above all, to improve performance and service levels.

The film covers the extensive and varied range of services offered by V/Line Freight. These range from the transfer of steel billets from wagons to the flat bed of a long-loader truck and the operation of container and grain block trains. It also highlights V/Line's Express Parcels and Freightgate Services and the overnight Superfreighter service to Sydney, which carries container loads of freight on a door-to-door basis. This service will shortly be extended to other States.

The film's message is reinforced by a brochure, which is being distributed to clients as well as to the public, emphasising the range of these specialist services. This points out that V/Line Freight has the people and equipment to carry everything from wheat to a container-load of mixed items, and that certain products such as steel billets, bulk cement and grain are too bulky to travel economically any other way.

Over the next few months there will be individual launches, concentrating on specific areas such as Freightgates, Express Parcels, bulk freight and Superfreighter services. Specific-commodity pamphlets are being prepared for the information of staff and will also be available to customers.

One example of this is the brochure outlining the Express Parcels service. As it points out this is "The parcel service other parcel services prefer to keep to themselves." It stresses that many private carriers merely load consignments onto a passenger train and unload them at the station destination for delivery by road.

In many cases V/Line can offer the same door-to-door delivery with the Express Parcels Shuttle, involving a combined rail/road operation.

With staff involvement, a major feature is the 'Strong Line' campaign, manuals and kits will be issued to Freight Services staff, giving comprehensive information regarding V/Line Freight Services and details of all freight rates. Regional Marketing Managers will brief staff at key country and metropolitan locations on the latest developments in freight.

The major thrust of the 'Strong Line' campaign has been to inform the business community of V/Line's strength as the major freight carrier in Victoria and of the scope of V/Line's commodity-orientated services.

As Stan Beevor points out, "This Division has focused heavily on meeting customer needs, because the harsh economic reality is that any business that does not, will eventually go out of business."



Huge government investment in rail projects is playing a major role in maintaining Newcastle and the Hunter Valley as the energy and heavy industry centre of Australia. Rail contracts with private contractors and sub-contractors have already given a major boost to the economy of the Hunter. Millions of dollars are involved in computerised signalling installations, track upgrading and strengthening, new lines, rolling stock and electrification.

These projects create employment opportunities, both in the railways and the private sector and resulting wages are contributing to the general economic health of the region.

The projects particularly aid movements of export coal and wheat - vital to the State's economy - and result in improvements for passengers, too.

#### **Coal**

Coal is the State's biggest export earner, and coal haulage is the biggest single freight task of the SRA.

More than \$800 million is being invested which will help make the State's export coal handling rail network more modern and efficient. A large part of it is going into the Newcastle-Hunter Valley region.

Part of the greater efficiency is in the use of "unit" trains, in which 3,200 tonnes of coal are hauled in 42 wagons. The "unit" train shuttles one grade of coal, in one type of wagon, to one destination. It makes the use of small wagons of different sizes disconnected from locomotives and shunted in marshalling yards a thing of the past.

This ensures faster turnaround of trains at maximum possible rate of delivery.

The new 81-class diesel-electric locomotives with a power rating of 2,240 kW (3,000 hp) are being used in the Hunter Valley to haul "unit" coal trains.

A record 100,000 tonnes of coal have been moved in the Newcastle area alone in one day.

On the round trip of 170 kms from Mt Thorley mine in the Hunter Valley to the coal shiploader at Port Waratah, one "unit" train can deliver almost three million tonnes of coal a year.

Road trucking that amount would mean 250,000 trips - almost one

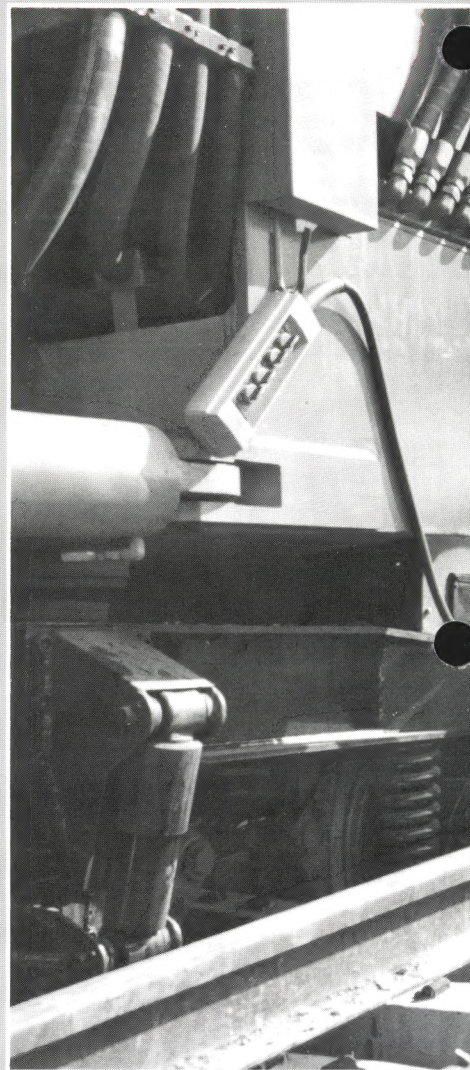
# **HEAVY HAUL PROJECTS HELP HUNTER VALLEY HEALTH**

truck every two or three minutes through the centre of Newcastle for a year.

To handle its coal haulage task the SRA is almost doubling the size of its mainline locomotive fleet. A total of 150 new mainline locomotives are entering service. Space-age developments have been applied by the SRA to the weighing of coal and to improve train traffic control for more efficient movement through the rail system.

"On-the-move" electronic weighbridges, one at Port Waratah and one at the Kooragang Island coal loader, ensure fast and accurate tonnage records. Trains can be weighed at speeds up to eight kmh. Two more weighbridges are likely to be constructed in the area. The weighbridges detect overloading and the on-the-move wagon check means minimal interruption to the flow of freight haulage.

The SRA is introducing a



*Part of the SRA's \$1.8 million Plasser track laying*

computer-based train planning and scheduling system which collates information from coal shippers, coal producers, loading terminals, coal loaders, and amounts of coal in stockpile.

#### **Wheat**

The "unit" train concept is also used for movement of wheat. Trains of 39 wagons haul a total of 2,340 tonnes.

About 170,000 tonnes of wheat a week are moved by "unit" trains - much of it to the wheat loading terminal at Bullock Island, Newcastle.

Other trains operate a shuttle service as required on branch lines from district silos to sub-terminals. More than 90 trains a week are available exclusively for wheat movements in the rail system.

Wheat haulage is a year-round job for the railways. Locomotives and wagons are allocated for the task before the season starts, under a predetermined plan set up on



working on the \$85 million Hunter Valley track upgrading project.

consultation with the Grain Handling Authority.

The SRA now has a fleet of 1,573 wheat wagons with a capacity of 134 tonnes. Up to 19 different grades of wheat and five types of coarse grains may need to be transported at any one time.

#### Track Upgrading

Early this year the SRA began an \$85 million track upgrading project on the 120 kms route from Muswellbrook to Port Waratah. This project should be completed in 1986 and the improved track capacity will allow faster movement of heavier coal trains.

It will also have a spin-off effect for faster running of XPT and other passenger train services.

Up to 187 staff are employed directly on the project, and if needed further staff will be recruited locally.

Part of the upgrading involves a contract for 215,000 concrete sleepers worth \$10 million, which has kept the Monier plant at Denman in production.

The Denman plant provided concrete sleepers for the Sandy Hollow line, and currently is supplying them for the Ulan-Gulgong extension.

This 25 km stretch of track, costing \$17 million, is the final rail link joining the west with Muswellbrook and the Hunter Valley.

It should be finalised by 1985. It joins the Ulan-Sandy Hollow-Muswellbrook line for coal from the Ulan mine to the coal loader at Port Waratah.

Ulan Coal Mines, working to SRA specifications and financing the \$70 million project, took over work on the line in 1980. The first train ran on the completed line in September, 1982.

Several other employers in the region are also benefitting from rail contracts.

A. Goninan & Co. holds a SRA contract worth \$81 million to deliver 100 suburban double-deck

carriages for the electrified rail network.

The last 40 cars of the order are expected to incorporate a new-look modified "nose" for a distinctive appearance, and improved interior comfort - including air-conditioning. Goninans is also converting freight wagons for wheat haulage, and building five power vans at a cost of \$4.6 million.

At Waratah, Comsteel is delivering rolled steel wheels, axles and steel tyres worth \$17 million for SRA rolling stock.

#### Electrification

As reported in the last Network electrification of the rail line from Wyong to Newcastle was completed in June at a cost of \$116 million. It has vastly improved the rail service between Sydney and Newcastle, giving an almost hourly service on week days. Travel time has been reduced to 2 hours 11 minutes, depending on the stopping pattern and time of day.

There are now 35 trips on weekdays instead of the previous 26; in the main, the need to change trains at Gosford has been eliminated.

The increased number of passengers using the Newcastle rail service since electrification proves its popularity. Revenue at Newcastle Station increased by 33 per cent in the two weeks following electrification.

That increase has remained steady, and has delighted the SRA; it is in line with similar experiences following electrification from Sydney to Wyong and Helensburgh.

On the Newcastle suburban network, 56 services are provided on week days - 15 more than previously.

Each week day 90 trains arrive at Newcastle Station.

Electric trains were also introduced for commuters between Fassifern and Newcastle, releasing self-propelled diesel trains to replace old locomotive-hauled trains between Newcastle, Maitland and Telarah.

The diesels offer passengers a more comfortable and faster ride, and better reliability.

The new electric double-deck interurban air-conditioned carriages in service on the Sydney-Newcastle line provide

passengers with a high standard of comfort.

They are equipped with the best rolling stock technology available and are equal to any operated throughout the world.

Hunter Valley people are also served by XPT trains on the Northern Tablelands line and the North Coast line to Kempsey.

#### Station

Newcastle Station, built in 1858, has been restored to its original condition by the SRA at a cost of \$600,000. Historic features of the station, such as its ornate wrought-iron embellishments, have been retained.

In June, the SRA opened in Newcastle an information centre to provide details of the Authority's massive capital investment programme in the Hunter Valley.

The centre features a display of local rail projects with maps, a video, and a scale model of a double-deck interurban carriage.

The centre is particularly popular with schoolchildren collecting project material on SRA activities. Information Officer Victoria Hughes is available to visit local schools and community groups to show films and speak about the capital investment program.

The centre is in Hunter Street, opposite Darby Street.

Railway land on Newcastle's waterfront, known as the East End land, was handed over to the people of Newcastle by the Premier, Mr Wran, earlier this year. It will be used for recreation and parkland.

Further railway land, when vacated by the SRA, will be given to Newcastle Council for recreational parkland and housing and commercial development.

#### CTC System

Signalling is now under a Centralised Traffic Control system at Broadmeadow, which cost \$45 million. It was designed to improve train traffic control for more

efficient movement through the rail system.

It used computers to centralise signalling control of train movements between Newcastle and as far north as Casino.

The system has been planned to incorporate equipment to provide automatic route settings and remote-controlled signalling for trains between Gosford and Casino, and from Werris Creek and Ulan.

The CTC computers integrate activities such as coal forecasts, equipment scheduling, operations management and equipment maintenance.

CTC is just part of the investment, technology and teamwork that have been the successful ingredients in the more efficient transport of passengers, coal and other freight by rail in NSW.

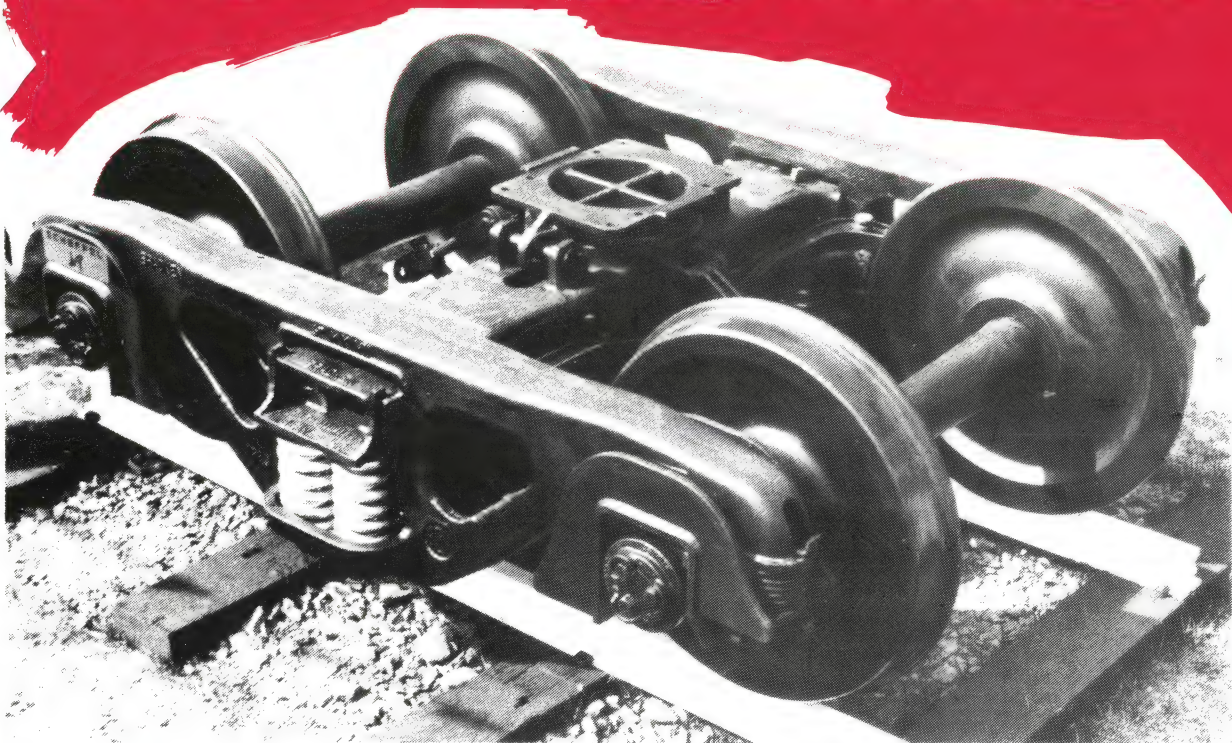
And that progress and development is now bringing tangible benefits to the people and industries of the Hunter Valley.



A 'unit' wheat train.

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# Westrail injects Staff input to

For over a decade Westrail has been using a corporate planning process to identify and evaluate strategic options for its future. As part of the process detailed budgets for the coming year are prepared and specific operating plans are determined. Over the past year there has been a significant addition to the groups who participate in the process, with the creation of the Participative Planning Consultative Committee. This group is now centrally involved, bringing to strategic planners the views of Westrail staff generally and receiving back from the strategic planners, in a very direct way, the results of their deliberations. The list includes:

George Milicic John Olding	Australian Railways Union W.A. Branch
Gerald Truswell	WA Locomotive Engine Drivers' Firemans and Cleaners Union
John Sharp-Collett Robert Rowe	Amalgamated Metal Workers' and Shipwrights' Union
Norm Xavier Michael Sales	Australasian Society of Engineers, Moulders and Foundry Workers Union
John Gandini Len Walton	Electrical Trades Union
Mick Gibson Allan Sharpe	Railway Officers Union
Fury Giovannangelo Nick Kletnieks	Association of Railway Professional Officers of Australia (W.A. Branch)
Bill Jordan Clarrie Brown	Australian Transport Officers Federation
Robert Falek	Association of Professional Engineers

In addition to representation from each of the associations and unions there is a technical analyst, Nenad Ninkov, made available by Westrail to assist the committee in evaluating the options.

In addition, one of the strategic planners is a member of the committee. Initially this was Dr. Paul Grimwood, Assistant to the Commissioner.

Currently, this is Kevin Donnelly, Westrail's Supply Manager. Westrail provides the facilities and the secretarial support to the Committee. Although just over one year old, the committee is now well established. It meets a week or two prior to meetings of the strategic planners and convenes a short time afterwards for feedback from them.

There is a good understanding among members of the group as to how it operates and the understanding is broadening in Westrail.

The PPCC had its origins in October last year at one of Westrail's regular briefings for staff, top managers and staff representatives. The briefing canvassed the strategic planning options facing Westrail.

The theme of strategic planning was taken up again two weeks later at a TUTA course for Westrail unionists addressed by Paul Grimwood. Out of these two sessions came the suggestion from the unions and professional associations that they be directly and explicitly involved in the planning process.

The suggestion was welcomed by the strategic planners of Westrail, and all associations and unions were invited to join with Paul in establishing the Participative Planning Consultative Committee. From its earliest days, the committee has had the strong support of the Commissioner, Ian McCullough, and strategic planners.

In Paul Grimwood's view, it was this strong support coupled with the determination of the union representatives on the committee that enabled the committee to survive its early, difficult days. One of the early difficulties was the handling of confidential information. Westrail recognised that if the committee was to be more than token, it was necessary to share with



Planning Group

members of the committee matters of a highly confidential nature.

Westrail's approach was to place its trust in the members of the committee to treat the material in a confidential way.

Initially, this posed some difficulties for committee members who were in the position on the one hand of having responsibilities to their members and on the other the responsibility towards the committee and Westrail.

Over time each member identified means of reconciling his responsibilities and loyalties. It is a compliment to committee members and reassuring to Westrail that there has been no case in which Westrail's trust has been abused.

While there was hesitancy in establishing detailed workings of the committee, there were some basic understandings reached at the beginning of the committee's operation which have been staunchly adhered to since.

One of these was the agreement that the committee was not an instrument for discussion or resolving industrial relations issues.

# Future planning Strategies.



Perhaps this agreement is one of the reasons why it has been possible to bring together into one forum representatives from all Westrail unions.

This had been tried, without success, in the years prior to the PPCC.

It may also be one of the reasons why, the during periods in which there are disputes between unions, the PPCC representatives have been able to maintain dialogue within the committee without the industrial relations issues affecting them.

Another basic agreement of the committee was that it would be an advisory group to strategic planners, not a decision making member of the strategic planning group.

The committee and its individual unions wished to be able to assess, and form a response to, any decisions of the strategic planners, without being bound by them.

Shortly after it began, the committee recognised that the information flow to the committee and strategic planners was very good.

At the same time it was concerned that it was not playing as active a role as it wished in the formulation

of the strategies and tactics that Westrail could pursue.

Since then two specific avenues have been pursued by the committee.

One is to appraise strategies and tactics formulated for the strategic planners from elsewhere in Westrail. The second is to formulate strategies and tactics of its own.

An example of the first of these was the appraisal of the Westrail approach to the prospect of timber deregulation in the south west of Western Australia.

Implementation of the Government's policy on deregulation posed for Westrail the prospect of the loss of a significant and traditional traffic, timber.

Westrail's approach to this was to develop, with the industry, a proposal that a major component of the market be retained under contract when timber was deregulated.

The PPCC was briefed by Westrail's marketing people and it then sought information from the industry in matters of concern to the committee. Input from sources other than Westrail enabled it to form its own

view and provide its advice to Westrail's strategic planners.

The PPCC has also formulated its own strategies and tactics.

In response to Westrail's strategy options A, B and C, the committee formulated what it termed option D. A sub committee was established to define and evaluate the option, making use of Westrail-provided resources wherever they were necessary. The committee work indicated a prima facie case not for rejection of the Westrail preferred option, but for enhancement of it with specific additions suggested by the committee.

Since that time strategic planners, who welcomed the committee input, have commissioned appraisal of the committee's enhancements along with the enhancements from the other sources within Westrail. There is clear evidence that in one year the committee has contributed to Westrail's planning in no uncertain way and that its existence has enhanced the communications between Westrail's top management and its workforce.

But what of the future? The committee does not operate in a backwater or a back room. It operates in the very dynamic environment that is confronting Westrail and confronts change in its own future as well as Westrail's. The relationship between the committee, strategic planners and Westrail itself is a delicate one. Just as there are undoubted benefits from its existence and operation, there are undoubted strains between the committee and Westrail. The issues are real.

Should there be a more direct involvement of PPCC members in strategic planning meetings? Is the gradual change in the PPCC's membership from paid association and union executives to workforce representation putting confidentiality, and the separation from industrial relations, at risk?

These and other issues continue to confront the committee and Westrail. The committee goes on, aware of the pressures on it and Westrail. It has dealt with issues as large in the past successfully. With goodwill on both sides there is every hope of its continuing to resolve them in future.



*An address to the Institute of Energy -  
September 3, 1984, Brisbane, by  
Mr. D. V. Mendoza Dip/Mech and Elec.  
Engineering, and F.C.I.T. Commissioner  
for Railways, Queensland.*



*Commissioner Mendoza.*

**T**hank you for your invitation to address you today and it is my intention to illustrate to you how Queensland rail has taken significant

and practical steps along the road of "Broadening It's Energy Perspective" and in so doing starting a trend which may follow through on a National scale.

On the previous occasion that I addressed this Institute I spoke of suburban electrification. I also spoke in Planning Terms of the potential benefits which we could obtain "If We Adopted Main Line Electrification".

You will no doubt be aware that we are now fully committed to electrification of the Coal Haulage Railways to Gladstone, Dalrymple Bay and Hay Point.

Plans for further expansion, pending a fairly heavy injection of capital, are in an embryonic stage. However, in our current maintenance and upgrading of track, fixed installations and last but not least timber bridge elimination and strengthening on major trunk routes, we are most conscious that when conditions are right further electrification will follow.

I am confident that just as Suburban Electrification has demonstrated its viability and effectiveness as measured by public acceptance, the operating results which we will achieve in Coal Haulage will be the best selling point to those who control the purse strings. Simply stated we believe there is only one real path for modern railways to take into the 21st Century.

I had previously stated that we would be endeavouring to capitalise on the most recent but service proven technology.

Of course we are in the age of High Technology and if like me you have difficulty understanding some of it they tell me you can take consolation in that if you can really understand how it works it's already "obsolete".

Solid State, Cybernetics and Telemetry are now fairly common place terms and it would appear that Micro-Processors and Fibre Optics will now share the centre stage.

I do not intend to go into great detail regarding Fibre Optics other than to say that they provide the answer to the problem of interference to communications by induction from alternating currents. At this stage and for the benefit of those who are not directly involved in transport, I will endeavour to provide a thumb-nail sketch of what is involved in Stages 1 (720 km) and 2 (773 km) of the Main Line Electrification Project.

The logical start point is of course the track. The question often asked

is "why persist with 1067mm? (or 3'6" gauge depending on your age group)". I do not know how many here present are familiar with the operations of rail traffic over less than 1435mm (4'8½" International Standard Gauge), however I can assure you that the South African Railways operate iron wagons of 100 tonnes gross mass over the same gauge as ours, using trains of approximately 2km overall length. Brazil even on metre gauge achieve very large annual throughput tonnages. And of course we're no slouches either.

Obviously a high standard of track is necessary and this is a prime requirement. The general understanding of soil mechanics has advanced hand in hand with the necessary mechanised equipment to translate theory into fact, and I pay tribute to early railroad builders who accomplished so much with so little. Original construction included earthworks of restrictive width in cuttings and on embankments, resulting in poor drainage in the cuttings, lack of support for the modern ballast profile and unacceptable side widths. Soil materials which are sub-standard by modern considerations must be replaced by suitable fill and compaction before the operation of a Heavy Haul Railway. Before the installation of Major Overhead Equipment the formation must be upgraded by the introduction of better materials, stabilisation of existing materials or installation of geo-textiles under the

# Broadening QR's Energy perspective

ballast, cuttings must be widened and embankments built up to modern requirements. Motor Vehicle Access is required along the full length of the track so that Maintenance Gangs can be positioned without track occupation and loss of capacity.

The latest generation of track will be of 60kg/m (head hardened where necessary on curves), fastened to prestressed concrete sleepers with resilient fastening systems for effective anchoring and ease of replacement.

In overall concept, the track system will be designed to handle the very high density of traffic and with provision to cope with massive vertical, longitudinal and transverse forces imposed by the operation of long and heavy trains.

Several innovative features are included including high speed turn-outs (1 in 16 crossing angle to provide 50km/h divergence speed), rail bound manganese crossings, manganese tipped heel-less switches, planed heavy duty guard rails and full sleeper-plating.

In anticipation of electrification all prestressed concrete bridges and all culverts have already been built to M220 loading, (the old Coopers E50) and can handle a 22.5 tonnes axle load.

When we have track in its correct location we can consider the installation of the Overhead Equipment which provides the 25kV 50 Hertz single phase current at the contact wire.

If I quote from specifications covering the Haulage to Gladstone you will receive a fairly balanced appreciation of the more Northerly Dalrymple Bay/Hay Point System, as other than a different locomotive supplier and more favourable grades, there is no great difference between them.

Basically, the line will be operated by electric locomotives of approximately 3000kW rating, (almost double that of our largest diesel electric locomotive with the ability to ascend ruling gradient at approximately 40km/h), working generally in Locotrol Formation with two locomotives in the lead followed by fifty wagons, the remote group of two locomotives, then the radio control vehicle and a further fifty wagons but no guards van.

The complete crew of three is divided between the leading locomotives, train protection is ensured by the used of track circuiting integrated with a Centralised Traffic Control System. The traction system to be adopted is the 50/25kV 50Hz system and there are separate contracts for the supply of electric locomotives, for works on the Signalling System for Communications and Cable Systems, for Civil Works, for Power Supply and Electrical Equipment, and for the Overhead Traction Wiring.

In explanation of the 50/25kV system, I would point out that the Contact Wire is energised to a nominal system voltage of 25kV to the rail and 50kV to the auto

transformer feeder wire. Under normal conditions the voltage may rise to 27.5 and 55kV respectively. Electrical energy for operation of the electrification scheme is derived from separate circuits and/or separate phases of the 132kV transmission system. The use of 50kV System has permitted a wide spacing of Feeder Stations 70km-100km.

The 25kV potential between catenary/contact wire and rail is derived by connection of 50kV/25kV autotransformers between the catenary/contact wire and the autotransformers feeder wire. The autotransformers are placed along the track at approximately 10km spacing. The centre point of each autotransformer is connected to rail via impedance bonds and also to an aerial earth wire.

I do not propose to go too far into the intricate and highly technical world of Signalling and Communications, however, the following points are noteworthy. Centralised Traffic Control has now replaced the former staff and tablet system on the rail links under review, but originally was installed in a non-electrified environment.

Because the integrity of the system is dependent upon the correct operation of low voltage D.C. electrical circuits carried by copper conductors in cables running parallel to the track, and upon low voltage electrical circuits in the rails themselves, the inductive and conductive interference due to high traction currents in the overhead

'We have taken active steps to not only contain but to reduce the cost of energy'

traction conductor (contact wire), requires to be eliminated. We have the answers but unfortunately time does not permit a detailed discussion. Briefly stated the basis of most modern signalling systems is the provision of equipment which detects the presence, or more correctly the absence of trains on a section of railway. A basic portion of the equipment is the utilisation of "Jointless Track Circuits" in contrast to insulated fish plate type joints which you have probably observed around the Brisbane System. In conjunction with the "Jointless Track Circuit" a transmitter is used with an output of one to four different frequencies to the rails. As I mentioned earlier in the talk High Tech is wonderful, understanding it is something different.

In the same technical plane, I would place Telecommunications and although we were offered the possible use of Satellites it appeared to be too costly and we will be using a system which I would reservedly call a "down to earth" system.

Major circuits to be provided are:-  
Train Control Circuits

- Omnibus
- Train Radio (U.H.F.)
- Maintenance Radio (U.H.F.)
- Ground Frame and Signal Post Telephones
- Automatic Telephone Connections
- Overhead Traction Maintenance Circuits
- Power Supervisory Data Channels Signalling Telemetry Data
- Channels

A major technological change will be the elimination of open wire aerial circuits (and pole routes). These will be replaced by an optical fibre cable which will run the length of the railway to provide "Interference Immune Circuits". The optical fibre system will carry information using Pulse Code Modulation (P.C.M.) carrier systems. A 30 channel, 2 Megabit system over two fibres will provide voice frequency (V.F.) circuits at railway signalling equipment rooms, traction supervisory locations and communication equipment rooms. Two other fibres will form a 8 Megabit trunk line between major stations.

All the foregoing will be provided so that trains can operate efficiently. The electric hauled trains will be basically of the same length as those we now operate with diesel-electric locomotives but with one significant difference (i.e.) in place of five, we will reduce to four but at the same time almost doubling the horsepower.

In context of this conference you will note that we have significantly broadened our energy perspective whilst at the same time we have taken active steps to not only contain but to reduce the cost of energy by the utilisation of locally produced coal rather than liquid fuel with its parity pricing overtones. The immediate Annual Saving in Liquid Fuel is approximately 93 Megalitres or about half Queensland Railways annual consumption and I am reasonably confident that the Financial Operating Results which we will achieve will give good cause to find the money for further expansion of Main Line

Electrification to other coal railways and then to general freight and passenger traffic on the main trunk routes.

I should also mention the employment opportunities generated by the project.

Many thousands of man-hours of employment will be generated to assist the employment of workers in most areas of industry in the State and the representatives of industries associated with railways who are present here to-day will no doubt have already done their sums to back up this statement.

In conclusion, perhaps we could look at the timetable for Stages I and II and you will note that by December, 1986, we will have locomotives operating in revenue service on both rail systems.

I thank you for your attention and trust that you have gained some appreciation of the size and implication of this project whose realisation is a source of considerable satisfaction for all who have been involved along the way.



Passengers



# V/Line boosts results with off-peak trains

**A**n aggressive marketing policy increased V/Line's passenger patronage and revenue by 10.8 per cent in 1983-84, and in fact more passengers were carried during the year than at any time since 1976.

One of the most effective moves initiated by the Passenger Services Division was a programme to increase the public's use of off-peak trains.

And although the demand for peak services remained high, off-peak patronage increased by about 14 per cent.

The change was brought about by promoting discount fares to destinations right across the state - discounts of up to 40 per cent. And a special "40% Super Savers" booklet was widely distributed to publicise the move.

The low fares attracted former peak period travellers and, happily, generated new patronage from people who hadn't used trains for years.

As a result of the off-peak promotion, more even daily distribution of passenger loadings, and better use of equipment and staff were recorded.

## Targeting Markets

But discounts for off-peak travel were only one aspect of the year's marketing project.

Discounts were also introduced for target markets - families, sporting and other groups, business people and tourists - and eye-catching posters advertising the concept were

produced for metropolitan and country stations.

Different fare schedules were also established for InterUrban (country commuter) and InterCity passengers. Interstate passenger business was not ignored in the new marketing concept either.

In fact moves made by the Division took interstate revenue from a 12 per cent decline in the year to January, to a seven per cent increase by June 30 - a total increase of 25 per cent in just five months.

The main reason for the dramatic improvement in business was undoubtedly the CAPER (advance purchase) fare.

CAPER fares offer price cuts of up to 30 per cent if the customer books and pays for his ticket at least seven days ahead of travel.

Before CAPER fares were introduced, interstate rail patronage was falling at an annual rate of 18 per cent, mainly because of the intense competition from the relatively cheap fares offered by road coach companies.

V/Line's Passenger Services Division now believes that the 1984-85 year will continue to provide new business opportunities, and an increasing share of the transport market.

Meanwhile, new airport-style waiting rooms and ticket offices at 27 of V/Line's major country stations will cost somewhere in the region of \$2½ million, Mr Alan Pobjoy has told Network.

Mr Pobjoy, V/Line's Senior Architect, said the upgrading of country

passenger facilities was well underway, with Benalla, Wangaratta, Shepparton and Numurkah Stations already completed and in use.

And work has already started at Camperdown and Ararat.

As well, in architectural projects separate from the passenger facility upgrading, a new station at South Geelong was recently completed, and restoration of Ballarat Station, damaged by fire, continued.

## Rooms Air-Conditioned

The new waiting rooms are fully enclosed, and either air-conditioned or heated.

"The aim is to provide much more comfortable and efficient facilities for both customers and staff," said Mr Pobjoy.

The rooms include toilets, and carpet surrounds the comfortable, lounge-style seating. Customers can make their bookings or enquiries at the ticket counter included in the new waiting area.

V/Line is working in close consultation with the Historic Buildings Council on renovation plans at several of their older stations.

V/Line carried more passengers in 1983-84 than in any year since 1976 and one of the significant contributions to the upturn, without doubt, was the improved rolling stock.

The N-class passenger carriage building project was completed during the year, with 57 of these luxury cars working the state as 19 three-carriage sets.

## passenger

The N-cars, likened by one commuter to mobile lounge-rooms, include air-conditioning, wall-to-wall carpet, picture windows and wool-upholstered armchair seating.

The modernising and refurbishing of other air-conditioned steel cars continued throughout the year, with seven BRS Snack Cars and six S/Z saloon cars being relitted along N-car lines.

Another rebuilding programme, involving 39 Harris (metropolitan) cars is well advanced, with 24 delivered during the year and three sets already working on the Kyneton and Seymour InterUrban routes.

With the delivery of the new and remodelled cars, VLine has been able to scrap still more wooden-bodied carriages, leaving only 42

currently in use throughout Victoria. Rolling stock engineers are continuing design work on what they are calling the 'next generation' of InterCity carriages with a decision on the start of manufacture still to be made.

### Locomotives

Contracts were let during the year for 25 new passenger and freight



*The rebuilt T-class loco, P12, heads a three-car H-set out of Melbourne.*

*A six-car N-set hauled by the new A71.*



*A section of one of the new airport-style waiting rooms being built at Victorian country stations.*







This exceptionally efficient diesel-powered railcar was not designated SPV-2000 by chance. The American Budd Company has combined sophisticated engineering, stainless steel practicality and its traditional fine craftsmanship to produce a Self-Propelled Vehicle which will conserve energy and operating costs into the 2000 — and beyond. And, because of its great versatility, the SPV-2000 makes it possible to provide frequent service with a minimum of units.

The SPV-2000 may be operated singly, in consists of up to six or more cars, or in locomotive-drawn trains of any length.

It may be efficiently used for commuter, shuttle and branch-line services, and for high-speed transit between cities.

It reverses direction in moments. And, since the SPV-2000 is diesel-powered, it can be operated in both electrified and non-electrified zones. (Fuel efficiency per seat mile is roughly twice that of gas-turbine-powered railcars.)

To further increase the useful versatility of the SPV-2000, Budd is offering a standard version and a high-speed version, with a variety of interior arrangements.

The addition of turbo chargers, high-speed gearing and aero-dynamic nose converts the SPV-2000 to a high-speed express.

A consist of three high-speed cars can attain 120 mph (193 km/h)

Since the nose is removable, the car may be returned to standard service if required.

#### **Power Package:**

The basic power unit is a 360 hp diesel truck engine (Model 8V-92 by Detroit Diesel Division of General Motors) equipped with block heaters and activated by an Ingersoll-Rand

air starter. Power is transmitted with torque converter. The final drive is a Budd-developed, coupled-axle unit with choice of gearing for maximum speed of either 80 or 100 mph (129 or 160 km/h). The high-performance power plant version is turbo-charged and rated at 400 hp. The transmission utilizes a modified torque converter. Final drive gearing is set for 120 mph (193 km/h).

#### **Control:**

Double ended. Single handle propulsion and brake master controller.

#### **Auxiliary Power:**

Power for auxiliaries is supplied by a 116 hp diesel engine equipped with block heaters and an electrical start system. The generator is a self-regulated unit with an output of 480 V 3ø 60 Hz 75 kW at 85°F (29°C).

#### **Diesel Fuel Tanks:**

Tanks are of stainless steel construction with a holding capacity of 300 U.S. gallons (1,135 l) (OR 250 gallons), sufficient to provide 80% of propulsion power for 8 hours, idling power for 8 hours, and auxiliary power operation for 24 hours.



**'... our tiny school dates back to 1878 and we were anxious to preserve some local history'**



## Old clock ticks for Lal Lal tots

V/Line's last mechanical clock that had been at Lal Lal railway station since the 1870's has found a new home.

Following representations from the Lal Lal Primary School Council, when they discovered that V/Line was to install an electric clock at the station, the old historic clock was given to the small nearby Lal Lal Primary School.

President of the School Council, Peter Mills, said that the school with just 31 pupils had no clock.

"Our tiny school dates back to 1878 and we were anxious to preserve some local history, particularly since the manual gates had been replaced with a flashing light system", Mr. Mills said.

In this picture a V/Line Manager, Public Relations, Kevin Baker (right) hands the historic clock to Peter Mills as youngsters from the school look on. Also in the picture are Reinhart Pohl (Principal), Alma Black (teacher) and Jan Cosgriff, Secretary, School Council.



# N.S.W's S.R.A. gains the world's most advanced Track Relaying Machine.

## SMD 80G... and it's unique to Australia.



*The SMD 80G at work in the Hunter Valley*

Back in 1968, Plasser & Theurer introduced the first continuous track relaying machine to European railways. Now, in 1984, Plasser Australia introduces a unique new machine to the S.R.A. of N.S.W., the SMD 80G.

This unit is the first machine in the world to be capable, without alteration, of both track renewal and construction work.

Built in Sydney, the SMD 80G is a tribute to the design expertise and construction capacity of Plasser Australia.

Plasser Australia Pty. Ltd.  
2 Plasser Crescent, ST. MARYS, N.S.W. 2760  
Telephone: (02) 623 9033. Telex: AA24140

# Plasser Australia

HELPING ADVANCE AUSTRALIA'S RAILWAYS

Meli/841

# \$160m ASER PROJECT

Construction work is about to start on a \$160m. project that will transform areas around the historic Adelaide Railway Station.

The heritage-listed Station building will be retained, but a 400-room hotel, a commercial office block of 22,000 square metres and a convention centre with capacity to seat 3,800 people will be built on a

plaza above the existing station platforms and rail lines.

The project, the biggest in Adelaide's history, is known as the Adelaide Station and Environs Redevelopment (ASER) and most of the rail platforms will be rebuilt as part of the development.

Off-site preparation is already in progress and contractors are

expected to start on-site excavation during the next few days.

Bulk excavation, piling, diversion of services, construction of the basic plaza-level structure and demolition, realignment and reinstatement of railway tracks will continue for almost a year.

It has been the dream of successive South Australian Governments to



*An artist's impression of the 400 room hotel which is to be built as part of the ASER project and will be operated by the Hyatt Group. At right in the existing Railway Station building and partly shown on the left is the proposed office block.*

# CT READY TO GO...



*The Premier of South Australia, Mr. Bannon pictured with the Chairman of Kumagai Gumi Co. Ltd. Mr. Jinichi Makita, at a ceremony held recently to mark the launch of the \$160 million ASER project.*

approve a development over the existing railway operations at the Adelaide Station. Plans and concepts came and went until four years ago when there was a call for registration of interest by the State Transport Authority. Pak-Poy & Kneebone Pty. Ltd., with a consortium of specialist architects, engineers, property and construction firms, was eventually awarded development rights. After many months of negotiations with Australian and overseas investors, Pak-Poy & Kneebone, put together a successful proposal to the giant Kumagai Gumi Co. of Japan. Armed with unflagging support of Adelaide's biggest property developer - the SA Superannuation Fund Investment Trust - Pak-Poy & Kneebone arranged the signing of an agreement between Kumagai and the Superannuation Fund as investors to the ASER project. In the meantime, Parliament passed a Bill to establish a casino in South Australia and that casino will be an important part of the ASER development. The casino will be housed in the existing Railway Station building, off the station's famous Marble Hall.

The SA Lotteries Commission is expected to name the operator for the casino later this year with the casino scheduled to be operating late in 1985.

The ASER project will provide a grouping of tourist facilities unparalleled anywhere in Australia. The 400-room hotel will be operated by the international Hyatt group which has already announced that the hotel will be of five-star standard. The convention centre will provide seating for up to 2,500 delegates in the main hall and 3,800 at other functions such as in-door tennis tournaments.

The design also provides for speciality retail shops and parking for more than 1,200 cars. Significantly, all of this will take place adjacent to Adelaide's renowned Festival Centre complex with the ASER Plaza in fact adjoining the Festival Plaza.

The development is taking place within minutes walking distance of the central core of the City of Adelaide so has easy access to all business, cultural and entertainment facilities.

It will accelerate the role of the City Centre as the main Adelaide service centre and is expected to further concentrate commercial activity in and close to the City Centre.

The project, which has been designed to cater for significant growth in tourism over the next decade, will enable Adelaide to offer all the tourism plant infrastructure necessary to woo the businessman, convention planner and holidaymaker.

In the immediate future, when assessed in building construction terms, ASER will provide jobs for an average 450 construction workers on site and some 1,250 jobs within the building industry.

Using construction multipliers, this translates into some 2,700 jobs in the SA economy during the construction phase. When it is completed ASER will create employment for more than 750 people and a further 3,000 direct and indirect jobs in the State.

These figures do not include the additional employment opportunities which will be created by the casino.

It has been estimated that the casino will directly employ more than 600 people.

The concept for the development of ASER is the result of analysis by the internationally-acclaimed John Andrews Group of architects. This Sydney-based firm is working in association with the Adelaide-based architectural company, Woodhead Hall McDonald & Shaw.


The highly imaginative ASER development follows significant worldwide achievements of John Andrews International. These include Canada's Toronto Tower, the Intelsat headquarters in Washington and, nearer to home, Sydney's American Express Tower.

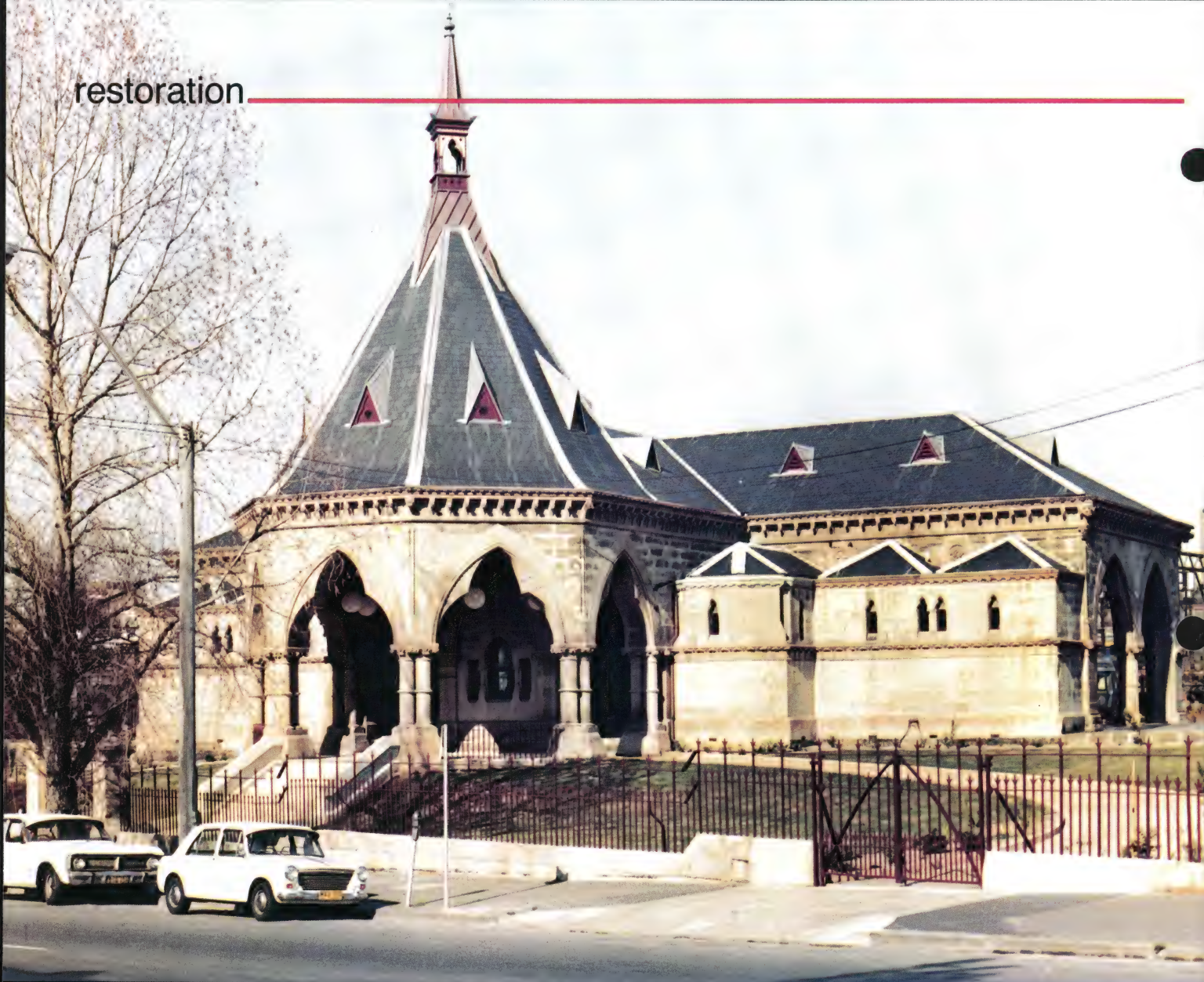
In association with the Festival Centre Trust and the Adelaide City Council, the ASER developers have initiated landscaping proposals for the area between the ASER site and the River Torrens. For the first time in more than a century, people will be able to move freely between the River and Adelaide's North Terrace which contains the centres of Government and the cultural base of Adelaide.

Kumagai and the SA Superannuation Fund Investment Trust will each contribute \$20m. as equity in the project. On top of these contributions, Kumagai will provide a further \$66m. as loans and the Superannuation Fund will provide \$54m.

Already more than \$6m. has been spent and about 100 people are currently employed full time on the project.

The Superannuation Fund is South Australia's biggest property developer. Its policy is to restrict its property investments to new development or major redevelopment so as to maximise the economic benefits to the State. The ASER project is Kumagai's first major venture in South Australia. The Tokyo-based group is also involved in a major development in Sale, Victoria, and more recently announced participation in several other projects in Australia.

The ASER project received the final seal of approval on October 11 by the SA Governor, Sir Donald Dunstan, in Executive Council. 



## New lease of life at 'Mortuary'

One of central Sydney's most significant historic buildings - the old Mortuary Station in Regent Street - has been fully restored and is to be given a new lease of life. The building, with its gothic arches and spire is more than 100 years old and was originally used for funeral trains departing for Rookwood Cemetery.

The Chief Executive of the State Rail Authority, Mr David Hill, said that options were being explored to find an activity for the site that was compatible with preservation of the building. The possibilities included operating regular steam train excursions; establishing a museum and sales outlet for railway memorabilia and setting up a restaurant or tea-rooms.

Mr Hill said, 'It is essential that we choose a usage that appropriately recognises the value of this building to our heritage and ensures that it will be protected for the future.

'In addition to the possible railway uses, we intend seeking expressions of interest from outside in the lease of the building. A community or church group, volunteer organisation or even a private sector entrepreneur could well have leasing proposals that are viable and in harmony with the style of the building, its surroundings, its history and its protection', Mr Hill said.

The Mortuary Station is the last remaining link with funeral trains which operated in Sydney for almost 70 years until motorised funerals took over. It was built in the 1860's for funerals to the then new cemetery at Rookwood and was designed in the Gothic-Revival style, befitting the requirements of the Victorian-era corteges of that time.

Mourners would travel from the Mortuary Station on the train with the casket for burial. The destination station at Rookwood

was dismantled in 1958 and re-erected in Canberra as a church. Mr Hill said the State Rail Authority had restored the building in line with the need to preserve railway property that was part of Australia's heritage.

The railways had many buildings of historic importance and in association with the National Trust was restoring those of the greatest significance as funds permitted.

'We obviously can't restore all of our important historic buildings at once but we are endeavouring to protect as many as possible in line with our responsibility to the national heritage', Mr Hill said. Costing over \$600,000 the restoration was undertaken with the close co-operation of the Heritage Council and the National Trust.



# Top R.O.A.C. post to Keith Fitzmaurice

Mr. Keith Fitzmaurice, Chairman and Managing Director of the State Transport Authority of Victoria which trades under the name of V/Line was recently appointed Chairman of Commissioners of the Railways of Australia Committee and the Australian and New Zealand Railways Conference. On October 23 he took up this position from Mr. David Hill, Chief Executive of the State Rail Authority of New South Wales. The position is held on a rotational basis by each of the chief executives of the Australian rail networks.

Melbourne born and educated, Mr. Fitzmaurice is a Fellow of the Australian Society of Accountants C.P.A., Fellow of the Chartered Institute of Secretaries and Administrators, Fellow of the Chartered Institute of Transport and Fellow of the Australian Institute of Management. He is also a Member of the Institute of Directors in Australia. Prior to joining the State Transport Authority, Mr. Fitzmaurice was Group Managing Director of Kemtron Ltd. electrical,



*Mr. Keith Fitzmaurice, Chairman and Managing Director of The State Transport Authority of Victoria.*

construction and property group. In addition Mr. Fitzmaurice is a former General Manager of the Sportsgirl group of fashion stores and has held financial and general management positions in other avenues of private enterprise. Mr. Fitzmaurice joined the State Transport Authority as its chief executive on July 1 1983. The appointment was one of a number of senior appointments from outside the public sector made at the commencement of the re-organisation of the Victorian Government's transport portfolio. The newly created body is now a multi-modal transport organisation

responsible for the operation of Victoria's country passenger services both rail and coach and for the entire public freight operations, both rail and road throughout the State.

The Legislation setting up the Authority requires it to aim for achievement of a profit from its freight operations.

A father of four and grandfather of two, Mr. Fitzmaurice, who is a former reserves footballer with the Hawthorn Football Club lists his recreations as reading, music, theatre, keeping fit and an interest in current affairs.



## Trainabout '84

Trainabout 84, a holiday expo. train organised by the Australian Federation of Travel Agents completed another successful tour from Brisbane to Cairns between 3rd and 12th August.

Consisting of twelve specially set up wagons and equipped by various travel groups the train also stopped at intermediate stations throughout the journey.

Railways of Australia was allocated one wagon and its display was co-ordinated, designed and equipped by Queensland Railways.

A major prize sponsored by R.O.A. of a return trip for two on the "Indian-Pacific" between Sydney and Perth was won by Mr. and Mrs. R. West of Elliott Heads, Queensland.

In all some 30,000 people patronised the expo. Thousands more visited the display which was placed at the recent R.N.A. Exhibition on its return from Cairns.



# FOCUS ON PERTH

The Institution of Engineers, Australia's 1984 Study Tour on Railway Engineering took place from 13 to 22 September in the Pilbara and Perth regions of Western Australia. Hosts were the Mount Newman, Hamersley Iron and Cliffs Robe River railways, Westrail and local high-technology firms. Fifty-two registered from all over Australia and two stalwarts came from the USA. Full access was given by the iron ore companies, who generously provided accommodation, transport and meals for the group's stay in the North West.

David Brown of Mount Newman organised the STORE on behalf of National Committee on Railway Engineering members Bill Wallwork (Mount Newman) and Bill Fahey (Hamersley Iron). The Cliffs Robe River Iron Associates hosts likewise put a tremendous effort into planning, briefing and escorting the outstanding Study Tour.

The Hon. Julian Grill, Western Australian Minister for Transport, was the guest of honour at the final STORE - 1984 dinner in Perth on Friday 22 September.

## On The Move

The party flew to Port Hedland arriving at 0230 on the Friday (0430 EST for those who had been in the air 11½ hours!) and were driven to Mount Newman's comfortable single-room staff barracks.

Friday was spent in Port Hedland, studying organisation, local research projects, the locomotive depot, car shops, yards, CTC and the dumper crushing and port operations.

The next day, two chartered buses (they always have radio in this remote area) took the group inland to Redmont Track Camp, members seeing en route resleepering with steel sleepers, and riding on Hy-rails and in the Plasser EM80 track recording car as well as the bus.

A number of interesting lineside installations were inspected en route and members were shown an ultrasonic plan detector car and the big Loram rail-grinding train in use. After a pleasant barbecue with the friendly trackmen at Redmont the buses took the party cross-country over the Fortescue River flood plain to Wittenoom Gorge, and via the

spectacular Hamersley Range National Park on to Tom Price, where Hamersley met the group and showed the party the mine operations, primary crushing and ore loading into the trains: bin for fines, loadout tunnel for lump. The group drove to Camp Anderson for the night; all these Pilbara railway camps form isolated outposts of civilisation (including airconditioning) in a very wild and lonely area of Australia.

The next day saw the group moving along the HIR track, visiting typical track, signalling and detector installations en route to Camp Curlewis for lunch, after which the party inspected the large P811 concrete resleepering train and visited millstream, an oasis area in the dry Fortescue R. Valley, before returning to Camp Anderson.

On the Tuesday the group drove to Dampier, where the HIR complex at "Seven Mile" was inspected - depot, workshops, CTC installation. The Pilbara Railway Museum (which includes several rare diesel locomotives and "Pendennis Castle" the famous Great Western Railway 4-6-0 steam engine) was specially opened up by the Society's Chairman Bob Vanselow and Mrs Vanselow for the party. Later the Hamersley port facilities were inspected.

In the evening Hamersley entertained the party at an outdoor buffet dinner.

Wednesday was spent with Cliffs Robe River Iron Associates (CRRIA) starting with the railway and port complex at Cape Lambert, which has the deepest berths (15m) and largest tidal range (5.8m) in the area; it can handle 250,000 ton vessels.

After a delightful lunch at Point Sampson an interesting track inspection took the group 116 km down the track to the long (365m) and very high Fortescue River trestle, fortuitously photographed complete with a train, after which the party returned to Dampier for a farewell dinner also hosted by Cliffs. An informal technical exchange planned for an hour lasted over two hours, such was the level of material. On Thursday, the last day in the Pilbara, the party was briefed on and shown over the spectacular



Heavy-duty ballast tamper on the Hamersley Iron Railway sold to North America.

North West Shelf Natural Gas project near Dampier by engineers of Woodside Petroleum, and then drove along the coast road via the lonely abandoned pioneer port of Cossack and Whim Creek, a famous local watering-hole, to Port Hedland where a cleanup (courtesy Mount Newman mining) preceded the evening flight to Perth.

## Pilbara Railway Technology

All the Pilbara railways are of standard gauge; the "big three" - the Hamersley Iron Railways, the Mount Newman Railroad, and the Cliffs Robe River Iron Associates Railroad - have several things in common:

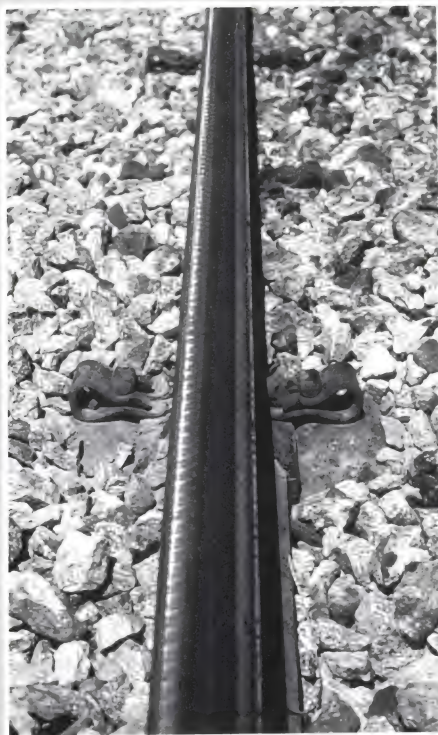
- \*de jure axleloads of 31.5t and defacto axleloads up to 35t, at speeds of 75 km/h
  - \*trains of 135-210 ore cars without brake vans (180 cars grossing 23,000t for 18,000t of ore is the current norm) 36/3
  - \*a common standard 2,685kW diesel-electric locomotive, the Comeng-Alco M636. Hamersley also has comparable Clyde-GM and Goninan-GE designs.
  - \*an extremely high level of technology in all departments
  - \*very efficient use of the computer to achieve cost-optimisation.
- These lines haul up to 45Mt of iron

# AND PILBARA



... Australian electronics on this equipment are being

ore annually over a single track, representing a both-ways gross load of over 70Mgt. They were engineered to the best North American standards of the late 1960s: 59 kg/m carbon rail, dogspiked on 1:40 soleplates to 250 x 15 x 2 540mm untreated hardwood sleepers, with a nominal 250mm of ballast under the sleeper. But as the mines boomed the ore tonnage increased fivefold, and the Pilbara tracks literally fell apart with the load. Rail heads shelled, flowed plastically, wore rapidly, and became both transversely corrugated and longitudinally waved on the flange face. Rails developed internal fatigue flaws and broke at an unprecedented rate, despite intensive ultrasonic inspection. Except for the locomotives, the trains fared little better. Wheels wore out in under 250,000 km for five turnings, centre plates failed, and air brake parts abraded away from dust. Couplers broke, parting trains in mid-section, or trains buckled and derailed cars were dragged 15 km before finally pulling up. And with 23,000t trains, a mid-train derailment usually means a major wreck, whose magnitude depends essentially on the emergency braking distance **after** the derailed



Ground rails on the Mount Newman railway. So accurately do vehicles roll that there is no contact on the steering surface where wheel flanges normally touch (note grinding marks).

ore car goes over, and the train pipe finally ruptures.

The Pilbara companies therefore found themselves in an upwards and escalating spiral of "firefighting" type maintenance and repairs, and it was clear that classic engineering solutions simply did not work on heavy-haul railways. An intensive programme of research was initiated involving the ore railways, the Melbourne Research Laboratory of the BHP Co Ltd, and other research firms.

This programme was applied in the classic manner: field data acquisition, model formulation, trials and application - and conducted under a rigorous procedure of economic cost-benefit analysis, and iron ore shipping cost optimisation. The programme is still in progress, and specific results have been reported in the literature; the following can summarise only some of the innovative work and results shown to the STORE-1985 group.

## Track/Train Dynamics

The first and the most fundamental area of research was the interaction between wheel and rail. As a result of this, rails are now routinely ground to exacting tolerances of head profile, the profiles being

different for the high and low side of curves, and different yet again according to curve radius.

Computer control applies to deciding what is ground and how much it is ground; grinding intervals are typically 3 months on curves and 6 months on tangent track. While line and level are recorded by the EM-80 car, current practice is to measure rail-head profile by optical means, at line speed of 80 km/h, every 5m along the track, and every three months.

This data is used to control the grinding train operations and control rail replacement; it is primarily a **preventative** programme designed to maintain exact profiles and thus obtain the right vehicle tracking, and not a reactive programme to **correct** the rail corrugations and side-wear arising from the wrong mode of vehicle tracking.

A corresponding workshops programme keeps wheels turned to a special "Pilbara" (worn wheel type) profile with underfloor lathes. The practical results of this track-train dynamics work are that relative movement - roll and pitch alike - between ore cars of a train passing at 75 km/h is undetectable to the naked eye, a phenomenon that was unique in the STORE members' experience.

Re-railing (previously at 8 year intervals) has been approximately doubled by controlled grinding and the use of head-hardened rail (recently on tangent track as well as on curves). Three of the previously four line maintenance camps on the Mount Newman Railway have been closed entirely and staff numbers reduced likewise by attrition; it costs over \$A70,000 pa to employ and sustain a man in this very remote area. The quality of vehicle is also attested by the fact that outside the ribbon of controlled contact and wear, grinding marks over the rail surface remain visible and actually rust between re-grinding, after 15 Mgt of traffic. Problems of shelling and plastic flow have been controlled on Hamersley's carbon rail and virtually eliminated on Mt Newman's head-hardened rail, which will have a probable life of well over 1,200 Mgt on tangent track, and not much less on curves over 800m radius.

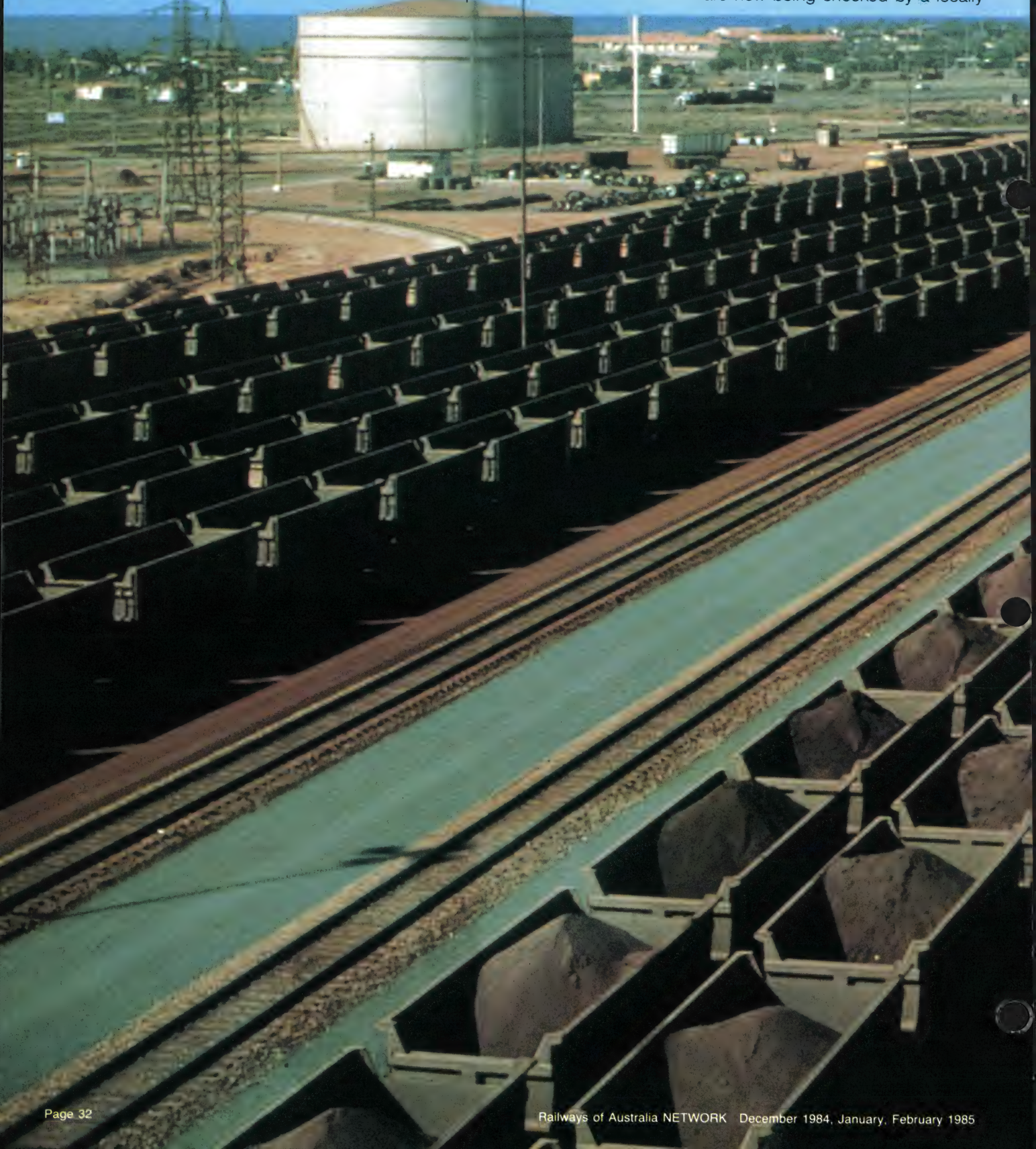
Ore car wheel life over five re-turnings has been increased from 200,000 to 1.0M km, and through the avoidance of lateral hunting and flange contact friction, locomotive fuel consumption has been detectably reduced. Previous train resistance curves have had to be recalculated, and computer programmes recalibrated, to reflect the reduced rolling resistance of these improved wheel and rail profiles!

### Train Handling and Data Logging

An extended research programme has shown that when a long ore train moves over dips and humps along the line, very high internal forces can be generated unless the train is handled very carefully indeed.

Coupled with accumulated fatigue damage from indexing long rakes of cars through the ore dumper, these in-train forces resulted in a spate of broken couplers.

These forces were measured, modelled and developed as a calibrated computer programme; a simulator now exists accurately to depict them on a VDU under all conditions, and thus to study various operating options (train length, position of locos in train, handling techniques etc.) This dynamic simulator is also used to train drivers in correct train-handling techniques. Locomotive and train performance are now being checked by a locally-



developed microprocessor-based on-the-loco data logging system. The driver is kept advised on a single readout and the tape cartridge is routinely played back and computer-analysed at the depot.

A future extension will also record in-train drag and buff forces, and suggest real-time corrective action to the driver, as well as recommending to the driver the driving strategy to optimise train movements, and best achieve the Train Controller's plan for

running meets, etc at minimum fuel costs.

This concept, which represents a near-ultimate application of systems engineering between all the railway engineering disciplines, should be operational in about two years.

#### **Other Pilbara Technology**

One leading European railway equipment manufacturer had developed an optical rail head profile measurement device; Australia currently has four systems,

and three of them measure profile to 0.1mm accuracy at line speed.

The statistical failure rate of improved car components is now known and to avoid wrecks, frequent hotbox and hot wheel detection is standard. The two major Pilbara railways now check for dragging equipment with smashbar protectors before all critical locations where a derailment will mean a wreck.

As a result of research the mechanism whereby fatigue flaws



develop in rails is now thoroughly understood; it is an internal and not, as was widely believed, an external crack-formation process.

Frequent ultrasonic patrol by cars using a new multiple-beam Australian ultrasonic inspection technology substantially based on that research now catches most flaws in good time.

The continuous track circuits detect others when the rail breaks, and today only the relatively rare and hard-to-detect "big dipper" or horizontal-S type of flaw which may preserve this track circuit still presents a major unsolved threat. Unfortunately this category of flaw is also the most dangerous, as the projecting rail head will usually break off and the train may derail in the gap. Ore trains have, however, ridden over 400-450mm rail gaps without derailling.

## Track Standards and Maintenance

Rail is 68 kg/m carbon or head hardened (Hamersley and Newman respectively); head-hardened rail costs about 40% more (ex mill) and lasts twice as long. Alloy rail is used only on a trials basis. Rail temperatures range from 0 to 75 degrees Celsius. Rail is flashbutt welded in the depot and thermit welded on-site; wide gap (up to 80mm) welding techniques are used. Rail renewal is done in winter at a destressing temperature of 30 deg C.

Rails can now be confidently worn down to only 55% residual head section without fear of breakage or poor vehicle tracking. Glued insulation joints are factory-assembled and welded into the track; one Pilbara railway is continuously welded from mine to port yards without one bolted or expansion joint.

On the Hamersley and Newman lines, all fastenings including switches are now resilient (Pandrol, Safelok, Traklok). The last sections of timber-sleepered track to be put in used treated hardwood sleepers with Gang-nail antisplit plates, with the sleeper length increased from 2,430 to 2,750mm.

The Hamersley railway is progressively re-sleepering with pre-stressed concrete and Mount Newman with steel sleepers, turnout sleepers ("timbers") expressly included in both cases. Rail creep and skewed sleepers are all but unknown today.

Ballast is now 300mm under the bottom of concrete or the upper

underside of steel sleepers. The quality of ballast and tamping is very high; sleeper movement under an ore train moving over a switch at about 50 km/h was visually estimated by STORE members at around 2mm.

New forms of high-durability, continuous-wheel support turnout have been developed with swing-nose crossings (frogs); no-lubrication features such as plastic slide chairs or rollers with rubber-pads to lift the moving switch clear of the intermediate slide plates are also employed. Huckbolts have replaced ordinary bolts. A revolutionary new form of stub-switch and bolt joint frog switch is being tried on Mt Newman.

Bolted insulation joints are out - today, insulation is by factory-glued joints welded into the track. Special "bootleg" sleepers for track circuit feeders eliminate loose cables (which get damaged when tamping) and feed the track circuit directly through standard rail fastenings. These have major potential for complex urban areas too.

All track renewal and maintenance is mechanised, using machines with an 80km/h move-to-work capability; this also applies to track monitoring, ultrasonic testing, and grinding machines.

Mount Newman uses telescopic rail cranes to handle its steel sleepers for spot replacement and sleeper renewal; Hamersley uses the large Tamper P811 type relaying machine for its concrete sleepers. Both railways employ contractors for relaying.

Both lines also use high-capacity tampers, with Australian-developed laser and microprocessor control of lining and levelling according to the computer determined track profile. All perway work is costed, monitored and controlled by computer. Visual patrol and medevac is by Hy-rail 4-wheel drive vehicles; daily resupply of line maintenance camps is by charter aircraft.

Hamersley formerly used a Jet Ranger helicopter to position emergency track crews and carry replacement couplers; its unfortunate crash coincided with the major problems being brought under control. Operation of the helicopter was costly and its replacement proved unnecessary.

## Rolling Stock

On the ore trains themselves, air braking remains a problem with occasional sticking of car brakes;

hot wheel detectors pick this up. Brakes are Austcopak and blocks are a high-friction, non-asbestos composition type developed in Australia.

The development of a totally new form of ep brake was raised in discussion; on fleets of up to 2,500 ore cars, compatibility will be a problem. Hamersley run married pairs of ore cars with a bar intercoupler and single brake control valve.

Wheel flats are all but unknown; some 2,800 axles passed STORE-1984 members and only three had flats (two on the one car). Car structure presents few problems, even though on the Cliffs line run-of-mine ore lumps of up to grand-piano size are dumped into the cars (which have floors of 20mm plate!) Wrecked cars are bulldozed aside, surveyed, and either stripped on site or recovered by road for shop repair.

On the Hamersley line sustained notch-8 power is applied to locomotives continuously for 3h. With dynamic braking, the traction motor duty cycle exceeds 90%. These conditions apply in summer temperatures up to 45 deg C and extremes of dust. Locomotives are therefore punished very severely. The diesels are programmed for service at 30,000km intervals to a 640,000km top overhaul, and all major components down to cylinder power assemblies,



Going, going .....gone! The three-car unloading tippler

governors etc are tracked by computer. By way of weekend relaxation, many of the Pilbara railway staff work on the famous GWR 4-6-0 steam locomotive "Pendennis Castle" which is preserved at Dampier.

**Operations and Signalling**

All operations on these iron ore railways are directed by radio, and no individual is ever alone on the track without hand-held or vehicle communications. The CTC systems are conventional and have recently been renewed or upgraded. Hamersley has a pole line for power and CTC communications along its route; Newman uses unattended diesel generators at each crossing loop. Both have microwave backup. Track circuits are of the coded type; the longest is 14km. The Robe River line has no CTC. It uses radio train orders, but has solar-powered electric detection of trailable facing points provided with an advance "distant" and a "home" signal to prove the correct switch throw to an approaching train. With 135 cars behind him, the driver has to have this reassurance in advance or slow down his train, which would waste fuel. Loaded trains take the straight at 70km/h. Trains are winched through car dumpers by an indexer arm (typically 360 kW) which grips the coupler; a yard-compressor car keeps the brake pipe charged. On one memorable occasion this compressor car was tipped; the

compressor was recovered (with some difficulty, before being crushed and shipped to Japan!)

**Washouts**

The greatest enemy of the Pilbara railways remains unchanged: the environment. The lonely region is some 1,600 km from the nearest industrial base (Perth, itself the loneliest capital in the world) and is wild, rugged and subject to extremes of heat. Average rainfall is around 200mm annually, but can be dumped randomly and at rates of 100mm/h, on areas with a high runoff, often resulting in two statistical 50-year floods somewhere on the lines, every year. Tropical summer cyclones with design winds of 200 km/h bring this rain.

Flood detectors have been installed, and continue to be installed, at many danger points. A float switch shunts out the track circuit and provides the equivalent of broken-rail protection.

When the Fortescue River floods the vast alluvial plains the Pilbara railways stop for several days until the water recedes, and track crews can move out to replace the washed-out Armco culverts and rock embankments (when their headlight illuminated an Armco culvert in a nearby tree some alert engine crew baled out before their train ran into the creek bed!)

**System Costs and the Research Payoff**

The published cost breakup of one Pilbara railway several years ago was as shown in Table 1 (% of cost/t-km, capital charges included) In terms of the applied research programme, that for one of the Pilbara lines covers the major study areas of cost relatively and reduction shown in Table 2. Figures are % of the total current costs covered by this programme (and **not** total freight cost in Table 1).

For the visiting railway engineer, there are other unforgettable impressions of the Pilbara railways additional to the superbly professional, total-systems-approach to the problems. The sheer spectacle of five big diesels slogging a 180-car train through the Chichester Ranges into a brilliant red sunset; the enthusiasm and dedication of the people; the willingness to be different and "have a go" if an idea looks promising; the distances, the scale. Like Montana, it is Big-sky Country, with big railways and people who think big as well.

**TABLE 1 - PILBARA RAILWAY TYPICAL COST STRUCTURE**

Item	%	%
Permanent Way		
Track	59	
Signals	4	
		63
Stock		
Locos	9	
Rolling Stock	16	
Workshops	2	
		27
Operations		
Administration	2	
Fuel	3	
Traffic	5	
		10
<b>Total freight rate</b>		<b>100</b>

The current (1984) end product is a "freight rate" of around \$A2.00 per tonne for an average 360km haul.

**TABLE 2  
PILBARA RESEARCH PAYOFF**

Research Area	Current Practice (1984)	Recom. Practice (Cost Target)
Rail replacement	41.8	37.6
Rail Defects (detection notification)	8.24	6.9
Loco fuel	16.92	13.14
Tamping, lining	11.18	18.78
Derailments	0.44	0.33
Bearings	0.13	0.10
Wheel wear	2.68	0.41
Rail grinding	18.57	12.98
	90.28	100.0

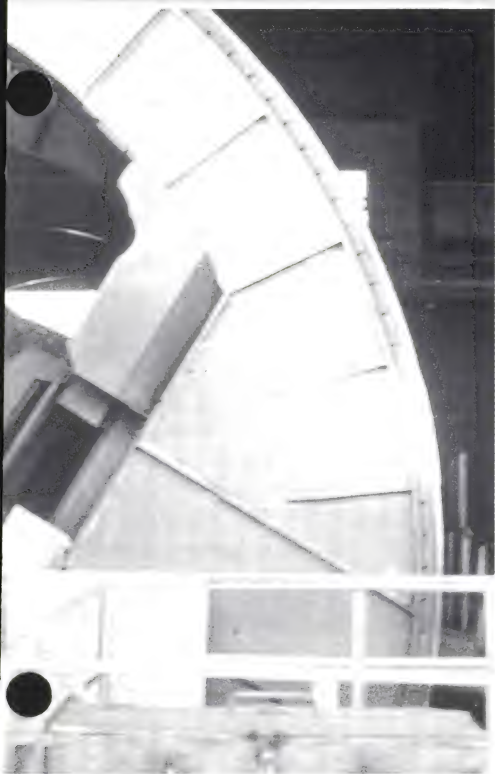
**STORE REPORT - 1984  
WESTRAIL**

For the final day spent with Westrail, the group was divided into small parties according to mainstream interests to inspect facilities within 200km radius of Perth.

The main civil engineering party visited two test tracks - the ROA test track at Cunderdin on the standard gauge, wherein are laid a variety of timber concrete and steel sleepers with a range of track fastenings. As well as the better-known Australian fastenings, Cunderdin is the test-bed for a number of prototype and imported designs, including some that have been rejected.

The party then visited the narrow-gauge Avon-Goomalling line on which is located Westrail's own test-track section containing some 20 sections of test fastening on timber sleepers.

(continued on page 52)



port Hedland dumps 300t of iron ore at a time.



**WE MINE THE ORE.  
WE MINE THE COAL.  
WE MAKE THE STEEL.  
WE MAKE THE RAILS.  
WE MAKE THE SLEEPERS.  
WE MAKE THE ACCESSORIES.  
WE RESEARCH THEM.  
WE TEST THEM.  
WE OPERATE RAIL LINES.  
COULD WE DO ANY MORE.**

BHP's experience in every facet of the design and manufacture of rail tracks would be hard to equal, anywhere.

The first steel we made, we made into a rail, (and we've been making rail ever since).

Today we're making a wide range of railtrack products which all share one quality: every one of them is designed to make rail a more efficient alternative to other means of transport.

#### **Rails for all traffic**

Our rail plant at Whyalla is amongst the most modern on earth. It was completed in 1983

and is producing rails which are the equal of the best made anywhere.

Universal rolling results in improved surface quality, reduced internal stresses and improved dimensional accuracy. Roll straightening also produces consistently straighter rails than older methods.

Ultrasonic inspection provides a guarantee of internal soundness over the complete length of each rail.

Lengths up to 27.4m are available.

#### **Head-hardened rails for high-specification lines.**

BHP's head-hardening techniques extend rail life by 100% or more. Head Hardened Rails are thus ideally suited to high wear and expensive replacement situations.

Their high strength and long fatigue life particularly suit them to uses involving heavy axle loads, curved track or restricted access locations.

The head of the rail is heat treated by a two-stage induction process followed by a high pressure air quench. This results in the formation of a fine pearlite



micro structure which provides superior hardness, strength, ductility, wear properties, and fatigue behaviour compared to standard carbon rails.

Head-hardened rails have now demonstrated their value over the 430 kilometre Newman to Port Hedland line, under axle loads of 32.5 tonnes and approximately 50 million gross tonnes per annum; at the Hoskins Kembla works of Australian Iron and Steel where 50 tonne axle loads are carried on 60 kg head-hardened rails; at the Kooragang Coal Loader, with 25 tonne wheel loads; and on coal lines in several States, including the SRA's main line in the Hunter Valley, the most heavily trafficked coal line in Australia.

### **The future of sleepers is steel**

Sleepers manufactured from BHP steel owe little to the steel sleepers originally designed in Europe half a century ago. They are engineered for today's traffic demands; and they cost less.

Steel sleepers are designed to absorb the shocks of heavy axle loads. They will not spall and break down as concrete will.

Steel sleepers are cheaper to install and will outlast timber. A gang laying 200 timber sleepers a day will lay 500-600 BHP steel sleepers directly on the formation.

Steel sleepers can be specified for a working life of up to 50 years; and there will be no losses to termites, rot or fire.

While lighter in weight than European derived steel sleepers, sleepers manufactured for BHP steel are designed to provide improved section properties, improved track stability, reduced bearing stresses and reduced sleeper ballast.

The reduction in weight also enables easier track installation

and repair. Steel sleepers are light enough to be man-handled, eliminating the necessity for mechanical assistance for repairs. Reduced weight also significantly reduces sleeper unit cost and transport expense.

Even when using 30% less ballast than timber, steel sleepers offer greater stability.

When required, an insulation system developed and proved by BHP provides over 20,000 ohms resistance between rail seats; superior to both timber and concrete.

There is also a full range of economical, maintenance-free, elastic fastening systems available which further reduce laying and maintenance costs.

BHP steel sleepers are available in four different types. The lightest is designed for uses such as those in the sugar and underground mining industries, the heaviest for some of the heaviest usage anywhere: at Mt. Newman and within BHP's Steelworks. BHP steel sleepers, have been proven in use, all around Australia.

### **Solving today's problems, developing tomorrow's breakthroughs.**

BHP's Melbourne Research Laboratories (M.R.L.) is one of Australia's leading centres for product and engineering research.

It is a world leader in high density, heavy haul railway technology.

A multidisciplinary team of mechanical, civil and materials engineers works in close liaison with railway operators and components manufacturers. The group develops and tests components, vehicle and track performance and maintenance practises. These studies then form

the bases for technical and economic models designed to ensure cost-optimum solutions to operating problems; and for management judgement of the consequences of changing operational and financial factors.

M.R.L. have contributed to making major advances in rail and wheel performance, sleepers and their fastening and insulation systems, wheel/rail interactions, vehicle dynamics, track design, track and vehicle maintenance economics, rail and track maintenance management and wheel maintenance management.

The services of the Laboratory are available for trouble-shooting in installation and maintenance problems, to assist in developing specific solutions for specific problems and for the development and application of technical/economic analytical procedures which enhance decision making processes by management.

### **A century's commitment to rail**

From its very beginning, BHP, has been closely involved in the development of Australia's railways.

As users, as suppliers and as operators.

Our commitment to rail is unquestioned.

As is our commitment to continue the work to make rail more efficient, more effective and more competitive.



**World leaders  
in rail technology.**

## Dudley Street Bakery . . . .

In the 1940s, particularly during the War years, the Victorian Railways Bakery was a busy place to be.

Situated at Dudley Street, West Melbourne, it formed part of the old Dining Car Depot, along with the laundry, kitchen and butchery, all run by the former Refreshment Services Branch.

It was all very much part of the railways' self-sufficient world, with its traditional policy of meeting most of its needs wherever possible with its own goods and services.

For many years the oldest and, up until the Second War, the largest employer in the State, the railways was one industry containing many others, and a forerunner of today's large corporation, training and promoting its own staff for eventual management positions within the organisation.

Established in 1923 the Bakery, which operated on a round-the-clock basis, supplied the extensive network of refreshment rooms at country stations that were then part of train-travelling life.

These were originally established as refreshment stations for travellers to enjoy a leisurely meal and a drink while the steam locomotives were coaled and watered.

As more rail services were introduced and stop times reduced to improve train-running large numbers of passengers had to be catered for in a limited time. As a result palatial rooms were built with long serving counters, such as the one at the old Benalla Station which was over 30 metres long.

The location of these refreshment rooms was determined by refuelling requirements, but with the expansion of country passenger services and the introduction of faster locomotives capable of covering long distances without refuelling many country refreshment rooms became a place to have a meal before or after a journey.

Staff canteens, or 'tea rooms' at Newport, Spotswood, North Melbourne and the Spencer Street offices, as well as the refreshment rooms for the public at Flinders and Spencer Street Stations were also kept well stocked with the bread, cakes and pies that came forth from the Bakery ovens.

It was homely fare, in keeping with those simple days and tastes, but even so railway catering influenced the eating habits of Victorians with various campaigns to eat more fruit and milk, and the Bakery definitely contributed to what is now accepted as the traditional Aussie meat pie 'n sauce.

Loaves of raisin bread, advertised as being "rich in natural iron" and the first wrapped bread of its kind in Victoria were bought by busy commuters at the fruit stalls at both City stations and blocks of rich fruit cake were delivered to Mount Buffalo Chalet.

Buns, wholemeal cakes - a meal in themselves, - scones, little queen cakes, as well as pies and pasties were all produced by staff in the busy and often flour-filled atmosphere of the Bakery.

The centre really came into its own during the War years when the Railway Refreshment Services supplied thousands of buffet meals on the platforms for troops arriving at Spencer Street.

Pies were loaded onto platform trolleys before the approaching train reached the Station so that they were served steaming hot, along with sandwiches, fruit, and, of course, cups of tea.

The railway newsletter of the time proudly recorded that over 4000 dozen pies were baked over the 1940 Christmas period, the largest number in the Bakery's history.

However, times and tastes change and the Bakery did not. By the mid 1960s an internal report found that the facilities were outdated and

recommended that the old timber benches give way to steel ones and that the solid fuel oven which had given many years of service be replaced with a gas fired one.

Other equipment, such as mixers, needed to be scrapped and new ones installed, while the building itself needed extensive renovation, with the provision of new floors and insulated ceilings, refrigeration in place of cooling rooms and enlargement of the packaging and despatch areas.

The closure of many country refreshment rooms at that time contributed to the decision that modernisation of the Bakery would be uneconomic. Production of all but the celebrated blocks of fruit cake, ceased in May 1968, followed by complete shut-down of the Bakery in September 1974.

For those that had helped to maintain the railways' historical self-sufficiency it was a sad day to see this, one of its many traditional services, finally disappear, but it was yet another instance of economic necessity to be faced in the interests of continued transition of Victoria's railways into a modern transport system.



## . . . a tradition long remembered

# New commercial role for rail workshops

Just as the State Transport Authority of Victoria is changing its face so is one of its most important Divisions, the Workshops.

In line with corporate restructuring the Workshops Division has, since April, operated its own Board of Management with the new Chief General Manager, Workshops, Dick Terrell, reporting to this group. Dick is quick to point out that although once the reorganisation of the Division is in place the Workshops will act as independent contractors for V/Line and MetRail, it is still very much an integral part of the State Transport Authority. "We are the repair arm of the railways, an area which can offer good business," Dick says.

*The substantial change in the new-look Workshops Division is that it will now service outside industry, as well as carry out its traditional role of manufacture, repair and maintenance of V/Line's own rolling stock and structures.*

The Workshops Management Board, responsible for setting its own commercial policy, consists of the Chairman, Keith Fitzmaurice, the two chief executives of the Transport Operations Division and MetRail, John Hearsch and John Grigg respectively, two distinguished industrialists from two major heavy engineering companies, John Hall, Managing Director of Indeng Ltd. and Bill Eddy, Director of Goninan & Co., together with employee representatives, Joe Garro from the Electrical Workshops and Denis Vanderhyde from Newport Workshops.

Guided by this professional team, the Workshops, under Dick, an executive with a vast and perceptive knowledge of both engineering and the survival needs of the transport industry in general, will not only build rolling stock, but will service the rail transport industry, tendering for the manufacture of wagons and other types of equipment involving fabricated steel and machining work. This is a dramatic further development from the former

Workshops Branch which was separated from the old Rolling Stock Branch in 1978.

The workshops first achieved prominence with the construction of the Newport Workshops in 1888. Here carriages and wagons were built and then steam locomotives, starting in 1893. Newport was so successful that by 1905 it finally put out of business its main competitor, the Phoenix Foundry at Ballarat.

**'The substantial change in the new look Workshops Division is that it will now service outside industry as well as carry out its traditional role...'**

As part of the railways' decentralisation policy Ballarat North and Bendigo North Workshops were established in 1917 and although both locations did produce steam locos their main task was a rehabilitative one, rebuilding wagons and overhauling cars, as well as the manufacturing of spare parts. Newport meanwhile stepped up its production of locomotives - with the exception of two M Class diesels all were steam - so that by 1962 a total of 536 steam locos, steam cranes, as well as electric locomotives and petrol-driven rail tractors had been built at Newport. In the 1940s the Workshops were diverted to the manufacture of small tanks and aircraft components as part of the war effort.

The work of the Workshops Division also includes the continuing repair and testing of electrical equipment for both V/Line and MetRail at the Electrical Workshops at Spencer Street.

The massive task before Dick and his management board is to modernise these key Workshops in terms of plant and equipment and to retrain staff to implement modern operating procedures.

Another new management direction, which reflects that of the organisation generally, will be to ensure a greater degree of decentralisation of authority throughout the Division.

Dick believes the Workshops can only survive by operating as a commercial enterprise tendering on an equal footing with its industry competitors by adopting certain imperatives.

"We have to develop our commercial and estimating experience to tender for work internally and externally and we must develop production engineering methods and designs to enable the Workshops to gain these contracts," Dick says.

"We must also develop quality assurance for specification and training on the shop floor to produce a quality article at a cheaper price."

"The first step is to recruit people from both within and outside the organisation for the new Division, where responsibilities are divided up into manageable packages and where there is much more authority, responsibility and above all, **accountability**," Dick says.

"We must identify our capital requirement, area by area, and methods by which we can increase our efficiencies and expand our markets, because unless we develop these functions and invest in modern plant the Workshops will not be able to retain even its present work," Dick concludes.



# the unique fastening system



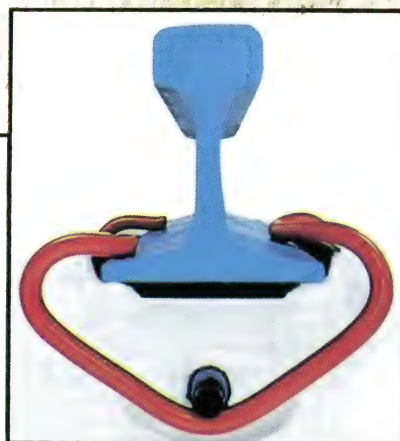
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# U.S. and Canada tour for rail men

The three-yearly overseas trip for Australian railway professionals is on again next year.

From 9 September to 12 October 1985 the Institution of Engineers, Australia National Committee on Railway Engineering (NCORE) is mounting a Study Tour on Railway Engineering to the United States and Canada.

STORE - 1985 will follow the basic format of previous Study Tours; flexibility, plenty to see within your specific field of railway interest (and not only engineering but strong operations, management, and financial interests as well), top North American professionals as hosts and lots of hard work.

STORE - 1985 has been substantially organised by the Institution's first non-Australian, non-member engineer to be appointed to an Institution of Engineers, Australia National Committee.

As a Senior Civil Engineer in AMTRAK and a veteran American attendee of five previous STORE's, Jim Michel is an expert both on what Australians will want to see and the best that the Canadians and Americans have to show.

His Co-Convenor is Ian MacFarlane, a past Chairman of NCORE who initiated the STORE programme in 1980.

The itinerary is set out below and contains a wealth of technical interest in all railway disciplines. New railway construction, in mountains and cities; track laying, upgrading and maintenance; two conventions and the world's largest display of track maintenance machinery; electrification and re-electrification under traffic at a different voltage; signalling; operations; locomotive and rollingstock factories; depots and overhaul works; railway research establishments; city railways, old and new; leading museums of railway heritage; modern light rail and train systems - all are there on STORE - 1985.

Additionally, there is a strong emphasis on the financial side of railways with briefings from expert assessors on how the efficiency and financial work of American railways is costed and assessed; marketing; the coal railway business including a

hard look at our international export coal competitors; piggyback traffic; and personal contact with the leaders of the North American railways and industry, and there is of course, the breath-taking scenery of North America and the excitement of life in her great cities.

## ITINERARY

- Arrive San Francisco (Main Party 9 September 1985)
- San Francisco (10/11 September)
- Seattle (12 September)
- Victoria, BC (13 September)
- Western Canada (14-16 September)
- Flight Day (17 September)
  - Fly (United) Vancouver to Denver or Dallas
- Chicago (20-24 or 25 September)
- Chicago/Toronto (24/25 September)
- Toronto (25/26 September)
- Montreal (27/28 September)
- Montreal/Albany/New York City (29/30 September)
- New York City/Philadelphia/Baltimore/Washington DC (1-7 October)
- Flight Day (8 October)
- Depart for Australia 12 October 1985

Spouses and mature teenagers are welcome on STORE - 1985, as members of the travelling group, at functions and on technical visits. Virtually all the cities visited are world famous tourist centres with no shortage of things to see besides railways.

## Volunteer Administrative Assistants

Depending upon numbers organisers expect to offer "assisted passage" to two or, possibly, three VAA's for STORE - 1985.

The form of assistance will be restricted to a free-of-cost trans Pacific Qantas ticket, offered to applicant professionals (preferably

younger engineers and railway operating officers) who have already registered for STORE -1985.

In return, the VAA will be required to assist the Co-Convenors during part of the tour and in particular to help cope with any crises.

Applications should be made in writing (with a CV attached) to Ian MacFarlane, Co-Convenor STORE - 1985, C/- Secretary, NCORE at IE Aust Headquarters, Canberra. Short-listed applicants will be interviewed by members of the NCORE in their State Capital and final choices made by the National Committee.

Each VAA offer represents, in effect, a \$A1,900 overseas travel scholarship grant and ALL young professionals, engineers and operating officers, in Australian railways, industry and the connecting community are urged to take up the offer and apply. Your professional stature will benefit as a result.

## Registration and further information

To obtain further details and an application form write to:

Mr Barry Heish  
Conference Manager  
Institution of Engineers, Australia  
11 National Circuit  
BARTON ACT 2600  
You can telephone Barry on (062) 733 633 or Ian MacFarlane in the evenings on (062) 813 489 for more details.



# Rail gets a green light t

The long debate about transport infrastructure across the Alps reached a new stage with the announcement in recent months by the Austrian Federal Minister of Transport of ambitious plans to divert almost the totality of road transit to rail by 1995.

The issue is an international one which focuses on the growing trade between Italy and northern Europe. The volume of freight has increased from 32 million tonnes in 1965 to 69 million tonnes in 1982 with further prospects of growth as the recession ends.

A decreasing proportion passes by sea through Italian ports (currently 30%) and the preponderant routing for traffic has been overland via the Alps.

During the period 1965 to 1982 it has been the road mode that has shown the most rapid growth from 2 to 24 million tonnes whilst rail has seen a more modest increase from 15 to 24 million tonnes.

This can partly be explained by the decline in traditional rail traffic like iron and steel but the considerable programme of road building has played a significant part in favouring lorries.

## Challenge of Road

The volume of road traffic has increasingly posed problems for the transit countries notably Austria and Switzerland where infrastructure costs and environmental dangers have created pressure for regulating the flow of road freight.

The Swiss government has until now relied on physical restrictions of weight and driving hours.

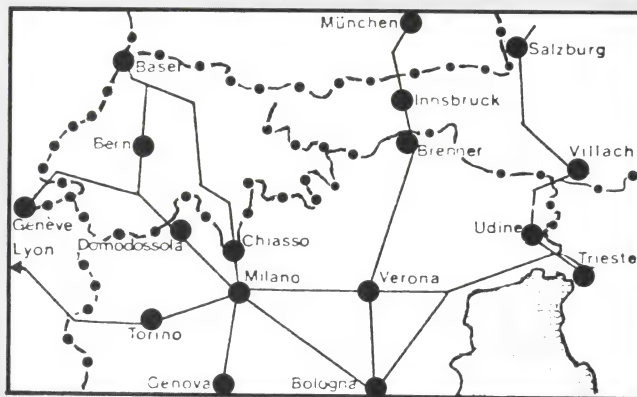
More controversial fiscal measures will be introduced in January 1985 to tax vehicles using motorways and vehicles over 3.5 tonnes.

The justification for such measures, repugnant to the road lobby, rests in part on the considerable spending on roads across Switzerland during the past 20 years, amounting to an equivalent of 450 M SF (240 M ECUs) per year, more than the level the level of government payments made to the CFF.

Roads have been constructed to meet explicitly the gauge and weight requirements of lorries.

To these visible costs it is necessary to add the environmental costs in terms of air and water pollution and costs to the tourist industry.

*This article is reprinted with kind permission from 'Ferinform' the magazine of the International Union of Railways, based in Paris. It focuses on some of the issues relating to rail and road freight which exist in the Alpine region of Western Europe. While the geography is different, the question of road-rail interaction is of interest to us all. Read on.*



Current transit traffic through Switzerland amounts to 0.7 m tonnes but the government fears that recent trends of 38% increases (1981-1983) will continue, if unchecked, towards an estimated volume of 10 M tonnes by 2000.

It has been the Austrians that have borne the brunt of the road vehicle traffic with an estimated 18.5 m tonnes in transit in 1983, 14 m tonnes of which represented traffic to and from Italy.

Again the international dimension of the problem has allowed the progressive diversion of road traffic to and from the German Federal Republic via the Austrian routes instead of via Switzerland.

The initial response of the Austrian government was to provide more road infrastructure often with international financial support. This approach, which allowed increased transit speeds in modern tunnels, enabled road to compete more successfully for transit traffic and hence grow faster. Transit tolls are now a regular feature for road movements on routes, through Austria as a means of financing road costs.

The annual vehicle charge on the Brenner route now stands at 17,000 OS (1020 ECUs).

The issue is not wholly a fiscal one in that it has become a central political issue in the Tyrol and exposed the perennial questions of environmental pollution.

It is therefore in response to these pressures and the increasing volume of transit traffic that the Austrian

government has, like its Swiss counterpart, proposed measures to curb the flow of lorries.

The Austrian solution is more radical and, by virtue of the comparative volumes, will have a more widespread effect.

The proposals tabled by Minister Lausacker seek the transfer of 55% of the road transit traffic to rail by 1989 and almost the totality by 1995. A fund has been proposed for the necessary adaptation of the rail network to accommodate this business by way of:

- loading gauge improvements,
- new terminals,
- new low-loader rolling stock.

It is envisaged that the preponderant means of rail transit would be piggyback, but it is significant that the government has stopped short of imposing a transfer of traffic in favour of equipping the railways and encouraging them singly or collectively to compete for it either by conventional wagons or combined transport techniques.

The risk of a minimal rail solution in the form of a shuttle service across Austrian territory would be a major lost opportunity for the European Railways.

It would also mean the likely shift of the environmental "front" from the Tyrol to Northern Italy and Bavaria where shuttle terminals would concentrate vehicles on either side of the Austrian frontier.

## The Rail Position

Where then do the railways stand in relation to the opportunity to gain a

# ough the European Alps

large share of the North-South axis freight traffic?

Four main routes currently provide the rail links:

- Lyon-Modane-Turin
- Basle-Chiasso-Milano
- Basle-Domodossola-Milano
- Innsbruck-Brenner-Verona

A fifth route, Villach - Udine, is mainly used for traffic with Eastern Europe.

All routes form part of the UIC's International Union of Railways European Infrastructure Master Plan as revised in 1981. Currently the Chiasso route via the Gotthard tunnel has traffic levels approaching its theoretical capacity of 250 trains per day (equivalent to 12 million tonnes of freight per year).

Work has been in progress on the doubling of the parallel route via Domodossola to achieve a similar capacity by 1990.

The Swiss routes together handle 9.7 million tonnes of rail transit traffic. The capacity of the Austrian routes is estimated to be 9.7 million tonnes via Brenner and 4 million tonnes via the Villach-Udine link. Current rail transit traffic is 9.1 million tonnes. Approximately 5.5 million tonnes of this transit traffic passes to and from Italy. The OeBB estimate that the capacity of the Brenner route is sufficient to absorb the first portion of the traffic to be transferred from road. The route via Modane is part of an extensive modernisation programme to bring its capacity up to 180 trains per day. Current freight traffic levels are of the order of 9 million tonnes per year.

The table summarises current rail freight traffic to and from Italy which is shared between the five routes. The figures are based on 1983 statistics of the UIC published in August 1984.

Unlike the road network, rail has relied on an historical infrastructure made comparatively unattractive by gradients, gauge restrictions and sharp curvatures.

The UIC has argued the case for base tunnels under the Alps as a longer term response to the demands of the Master Plan.

The addition of the UIC C1 gauge provides new scope for piggyback traffic whilst higher speeds, in addition to helping freight transits, offer new opportunities to exploit the inter-urban market for passengers on

000 tonnes 1983

Traffic to Italy		from Italy	Total
10	Great Britain	79	89
2,009	France	6,663	8,672*
719	Belgium	583	1,301
2	Luxemburg	46	48
546	Netherlands	454	1,000
2,189	Germany (F.R.)	4,813	7,102
57	Denmark	50	107
35	Norway	26	61
143	Sweden	692	835
91	Czechoslovakia	447	538
41	Germany (D.R.)	52	93
63	Poland	175	238
612	Hungary	171	783
2,139	Switzerland	1,334	3,473
1,351	Austria	773	2,124
10,006		16,358	26,364

\* An estimated 19% passes via the Ventimiglia coastal frontier.

routes like Munich-Milan and Lyon-Turin, where rail competes with air.

In a report produced by the European Parliament earlier in the year, support was given to the construction of one base tunnel which would improve the capacity and quality of service by rail across the Alps.

The projected diversion of road traffic to rail raises new issues of rail capacity on all routes. The likely growth in trade with Italy across the Alps also increases the dimension of the problem.

A base tunnel requires an estimated construction period of 10 to 15 years. It also requires corresponding modifications of capacity to the adjoining rail networks. The investment sums are involved are considerable and the pay back period long as a result of the construction time.

Above all such projects demand a high level of international governmental cooperation and commitment which so far the Alpine problem has lacked leaving Switzerland and Austria to pursue their own transitional solutions which affect each other and the wider European community.

The challenge to the railways is not only one of infrastructure however.

As the debate over the diversion of road traffic has shown, quality of service is an important element.

The development of "rolling roads"

has allowed a significant growth of piggyback traffic. Kombiverkehr and Hupac showed growth rate of 9% and 11% respectively between 1982 and 1983, and the new Okombi company in Austria has made some progress in attracting transit traffic as well as Austrian business.

Intercontainer has also made considerable progress in attracting business between Italy and Northern Europe.

If combined transport techniques are to provide most benefit to the European Railways, it will be important to develop services of longer transit than the 110 km across Austria which Minister Lausecker's proposals might imply. There is another important challenge in making sure that conventional wagonload methods can also attract new business on transalpine routes. The development of quicker frontier clearances as offered by inter-railway agreements on technical inspections and new control facilities as at Domodossola need to be supported by the sort of monitoring systems offered by Transinfo and Hermes and by new generation services. The North-South axis across Europe presents a very significant opportunity in the present climate of debate and it is important that rail wins the confidence of customers rather than wait for further anti-road measures to provide new business on a plate.



## By a Special Correspondent

### Design Challenges

In conceiving any ship, the naval architect has to meet a commercial specification and safely reconcile the needs of compartmentation, stability and power plant.

In few vessels does this pose more problems than a train ferry, where he also has a crowd of railway engineers looking over his shoulder as well.

The first problem is that on a train ferry, the cargo is by definition heavy - very heavy. And it has to be rolled on and off as rakes of wagons. The train deck therefore has to comprise an open space from the forepeak collision bulkhead to the stern door.

It has to be level, and set as low as possible in the ship. The need for a door and the likelihood of the ship's heeling over during loading fixes this deck level about two metres above the waterline.

The ship's watertight subdivision is, therefore, restricted only to the space *below* the train deck. It cannot extend right up to the main deck level as in a classic cargo ship, a tanker or even a passenger liner, and as a result the hull volume under compartmentation is substantially less on a train ferry. The train deck also has to be strongly built, not only to carry the trains, but to withstand the berthing impact.

In terms of basic compartmentation, therefore, an ocean-going train ferry is less like a classic ocean-going ship and more like the open, barge-like "car flat" seen on harbours and the Great Lakes in North America. But being ocean-going, the train ferry still needs a proper ship-like form to enclose and protect the train deck from waves and weather, and a proper superstructure above the train deck to carry the passengers and crew.

If, however, this train deck enclosure should be penetrated, the enclosed sides will mean that the ship cannot easily shed water the way that a barge could; the water will accumulate.

The large free surface (sloshing effect) can create a very serious threat indeed to stability if such a ship even gets herself into trouble. This design problem is fundamental to all ro-ro ships; it was free water (on the car deck) that finally caused the capsize and loss of *Wahine* at Wellington.

The ro-ro ferry *European Gateway* was lost outside Harwich, England last year not primarily as a result of her direct collision with a British Rail ship, but as a result of capsizing.

Closer to home still, the Tasmanian ro-ro ship *Straitsman* capsized and sank in the lower Yarra River in Melbourne after an officer prematurely opened the stern door and water entered.

Great care is therefore taken in the design of the NZR ships to get unwanted water off the train deck, and under control, *before* it can accumulate as a large free surface.

This is done by draining it overboard or into a well-compartmented double bottom, whence it can be pumped overboard as quickly as possible.

In achieving this, the designer is helped by the fact that train ferries are designed with built-in heeling tanks and high-capacity pumps in order to limit list when loading and unloading the trains.

The 4-track *Arahanga* and *Aratika* have capacity for 1200t in 50 (4-wheel equivalent) wagons, corresponding to up to 300t per rake.

When this load is shunted onto or off an outer track in less than a minute, it causes a very significant rolling moment.

As roll must be held at less than 5 degrees for reasons that will be explained later, rapid cross-pumping of corresponding ballast water is used to counteract this roll.

Ballasting is controlled by the First Officer from a pumping control panel located near the stern door.

This high pumping capability helps to make a train ferry fundamentally safe.



*The Tamahine*

No operator of rough-water ocean-going train ferries uses bow doors; the ships are always backed into their berths to load and unload. But even though a stern door is protected from head seas, it cannot be a mere roller-shutter. A very stout steel structure is needed, built to strict Lloyds of London requirements, and fitted with multiple locks around its perimeter.

Its watertight integrity is essential, particularly if the ship is hove-to in heavy stern seas - essentially an emergency situation, it is true, but nonetheless a conceivable situation and therefore one that has to be catered for.

The stern door lesson was learned by Lloyds over 20 years ago when a British car-ferry was broached from the stern and lost during a storm in the Irish sea.

But even the stoutest door could not resist attack from the inside by that most perfect of all battering rams, a



railway train rolling fore and aft along the train-deck as the ship pitched in heavy seas. And that famous photo of *Aramoana* in a Cook Strait storm shows the 4,900t ferry pitching at a grade of around 1 in 5!

The NZR wagons are therefore coupled together with special "kidney links", shunted against the stop block forward, air-braked, and individually secured onto the deck with up to four turn-buckle links per wagon.

High-centre-of-gravity wagons are also propped.

## Engines

On a conventional cargo ship the engine room enclosure projects vertically through several decks and in the interests of light and ventilation, often incorporates a light-well through the superstructure up to boat deck level.

There is thus no practical limit on the height of the engine and with diesel ships, very tall, slow-revving (typically 100 rev/min) reversible direct-drive engines are the norm, such as the Sulzer, Burmeister and Wain, Doxford, Stork etc.

On a train ferry, however, the engines have to be fitted in below the train deck and above the tank-top of the double bottom. And once in, it is a major structural rebuild to pull an engine out again!

The engines, transmission and auxiliaries also have to be divided between different compartments in the interests of safety, in case one compartment should become flooded.

A train ferry displacing 5,000t needs about 7,000kW to cruise at around 18 knots, calling for low-weight, high reliability marine diesels - either two in the approximate 3,500kW class, or the use of multiple engines coupled in some way - driving at least two

shafts. Electric transmission is the most flexible but usually also the most expensive way to achieve this. When *Aramoana* was designed around 1960, the needed 3,500kW engine was not available. The power plant chosen for the first two NZR ships was therefore in essence a multiple-unit diesel-electric locomotive plant. Six 750rev/min English Electric marine engines (the 1320kW marine version of the EEC0 10 x 12 inch rail traction diesel engine also used on NZR) were coupled to six 750Vdc generators, and electrically arranged to drive four 1680kW propulsion motors, grouped in pairs onto the two shafts. This arrangement gave full astern power, variable speed control and excellent manoeuvrability. The price paid was that there were six "traction" engines and 96 cylinders to look after, plus another three diesel-alternator sets with a straight-6 version of the same engine for auxiliary power, giving a total of 114 of the standard cylinders in all. But cylinders are still cheaper than ships, and with *Aramoana's* arrangement, power plants could be taken off line for on-board maintenance with imperceptible loss of speed (the propulsion power demand rises with the cube of a ship's speed).

Even though *Aramoana's* engines originally suffered major problems from broken crankshafts, the vessel still ran a reliable single-ship service. So *Aranui* had the same six-engine plant.

When the larger *Arahanga* and *Aratika* were built, larger power plants were available. These ships therefore had two large 520rev/min Pielstock V12 engines, each of 4,270kW, driving through a Fawick disconnect clutch and a 2:1 reduction gearbox to a Kamewa controllable-pitch propeller.

These propellers gave the necessary reversability, astern-power capability, and manoeuvrability at a slight price in hydrodynamic efficiency.

The new *Arahura* is a mixture of both concepts - a four-diesels 2-shaft ship. The multiple-engine arrangement gives *Aramoana's*

## across

reliability and maintainability, the electric drive gives flexibility, and the use of alternating current eliminates commutator and brushgear maintenance.

The controllable-pitch propellers are still needed for astern power and manoeuvrability because the ac machinery is essentially a constant-speed plant.

A large factor in the excellent maintenance performance of the NZR ships' engines has been their use of marine fuels which more closely approximate in pumpability and low sulphur content to the distillate fuels used in diesel locomotives (and in trucks, buses, earthmovers etc).

Such marine fuels are, however, increasingly expensive today and NZR is reluctantly having to follow most deepwater shipowners in moving from distillate to ship's fuel oil.

Some of this stuff now on the market is pretty dreadful: an Australian marine engineer recently described it to **Network** as "water, sulphur, sand and road tar"!

The high-sided, two or three-deck superstructure and the relatively shallow draft of a rail ferry make her a very difficult ship to berth in a cross-wind (the cost of tugs is of course unacceptable for such an operation).

Bow-thruster propellers are therefore standard equipment; one 750kW thruster is used on the first two and two 450kW thrusters on the second two NZR ships.

The ship must, however, have stern way of around 3kt on as she backs into her berth for the rudder to "bite" and thus steer the stern in, and this means that the ship's train deck and stern, and the berth, have to be designed to accept the substantial thump of having a mass of 4,900t - 9,200t clout the dock at up to 1.2m/sec.

In practice the final berthing manoeuvre is usually done with hawsers and deck winches. Sharp seamanship is called for.

This leads us to the second major element of the system: the terminal and its drawbridge.

The ship-to-shore "link span" is probably the most important element of this, being part bridge and part clamp. All ships have a carefully-profiled belt rail (sponson) around the stern to back against matching fender structures; consistently achieving this match has proved quite a tricky problem.



*The Rangitira I*

The ship is clamped in place in all directions save the vertical by a stout steel pin on the link span which drops into a hole in the stern structure, and two other latching devices.

The link span is designed to cope with the extreme range of tide and ship's draught, i.e. from the "high" condition of shunting the first wagon onto an empty ship at low fuel, trimmed bow down at the highest tide, to the "low" situation when the loco shunts the first wagon off a fully-laden ferry, fully-fuelled, stern-down and at the lowest tide.

All this has to be done on a 1 in 24 maximum grade on the link span.

The design tidal ranges are 1.67m at Wellington and 2.13m at Picton (in nautical terms, a round 5½ and 7 ft.) and coupled with a no-load to full-load draught range of 0.66m for the first two and 1.37m for the second two ships, the link span arrangements vary from 28 to 49m in length.

The link span must also be able to cope with the maximum heel of the vessel - designed at 7 degrees, but held at 5 degrees by Masters' Instructions - within the 1 in 200 twist of a 4-wheel wagon and a maximum 3mm step.

To achieve this twist, the deck to side-girder connections of the link spans are pin-jointed, and the relatively thin deck of the span actually twists.

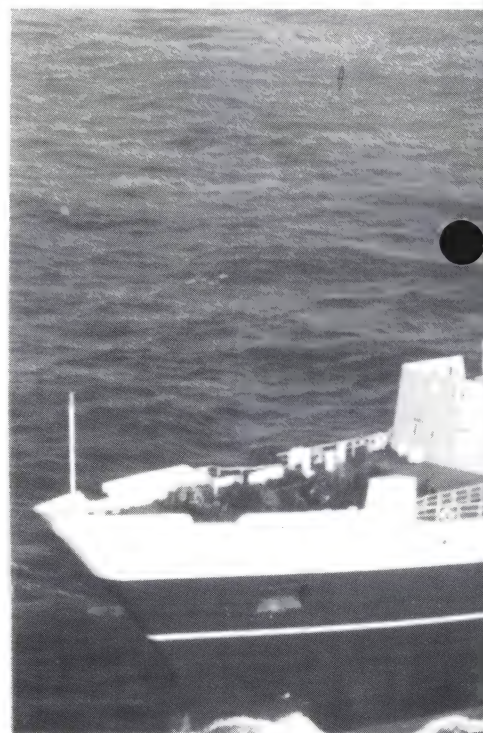
On the original two ferries, motor cars were driven over the ship's stern quarter to an upper-deck garage.

On the remaining three, cars are driven on and off over the stern centreline using the upper deck of a 2-deck link span. All vessels can

also load road vehicles on the train deck, via the lower deck rail link span.

On every passenger sailing, the last vehicle onto and the first off the train deck is a NZR 3-ton lorry loaded with the passengers' baggage. These would have to be the only lorries in the world that travel over 200 times further on the water than on the land!

The terminal arrangements are designed to separate, as far as possible, rail and road traffic. And



*The Rangitira II*

with 60 min turnaround, operation is very smart.

When **Network's** correspondent crossed in *Aratika*, the Picton Yard shunter was pulling the first rake of wagons off the ship just 4 minutes after her first contact with the fenders, and the ship was on her way back to Wellington in only 45 min!

The terminals are owned and operated by the respective port trusts at Wellington and Picton and are by far the largest source of harbour dues to both ports - over half their revenue.

The economy of Picton also depends to a very large degree on its role as southern terminal of the Cook Strait ferry. Proposals to move it to a new railway port on Cloudy Bay, however logical in terms of shorter distances by sea, rail and road, bypassed 1 in 37 grades etc., seem unlikely to escape political torpedoes from the burghers of Picton.

The third key element of the service is of course people.

The NZR ships were originally crewed and managed by the Union Steamship Company under contract to NZR, but since 1971 have been an integral part of the Railways' operation.

The crews are all Wellington-based; they live on their ship for periods of up to three days (a chief steward told Network he lived on board for one month) and they stand watch in the normal way.

This has implications in accommodation planning - although working a short-haul vessel, the crew still need their own cabins - and in catering.

The passengers' meals are in essence pre-cooked cafeteria snacks, whereas the crew's food has to comprise full meals of a high standard, cooked in a separate galley on board.

The engineers maintain their own ships.

With the involvement of several Unions in maritime, stevedoring and railway industries and a rather complex mix of operational rail needs and maritime traditions, there is ample scope for industrial trouble.

There is, however, a great deal of pride in the service, and it shows in the impeccable condition of the vessels, the smart turn out of the crews, and the recognition of the importance of this service to New Zealand.

The ferries command a high public reputation for reliability, punctuality,

and courtesy of the staff, and are one of the NZR's great success stories in recent years.

Success, however, always has a thousand partners. There has been more than one attempt over the past twenty years by the NZ equivalent of ANL to take over this profitable shipping enterprise from the railways.

Land transport in NZ was deregulated in November 1983, and a mushrooming of the trucking industry is expected as road operators scramble for the line-haul traffic hitherto carried almost entirely on rail.

Newly liberated road operators of this kind dislike by definition anything to do with the railways - even the frequent ro-ro service operated by *Arahanga*, which was designed to carry them and has done so very efficiently for over a decade.

A second hand ro-ro truck ferry has therefore been obtained by private interests to ply between Wellington and Lyttleton, the rust painted over in sky blue, and the vessel bravely renamed *Spirit of Free Enterprise*. Some observers find it hard to see a single-ship service with an approximate twelve hour sailing time offering the trucker a very attractive alternative to the more frequent NZR sailings, with their 3 hour 20 min crossings and a five hour drive. For traffics with a rather longer road segment at either end of the voyage (e.g. Auckland - Christchurch, Wellington - Invercargill) there may be attractions to owner-driver truckers, and this competition is being taken very seriously by the Railways.

It will be interesting to see what happens when all the rhetoric and hoo-ha have blown over, and battle is entered on the stormy seas of service and reliability, revenue, costs and cash flow.

But given the shorter route, better ships and the potential for rates based on marginal costing, the more experienced sailormen of the New Zealand Railways are well-placed to compete. Network's money is on the Old Firm.



# This quarter's selection offers variety

This quarter's selection offers interesting books, locally and from the U.K. First, for the company library we have an old friend...

## Janes' Urban Transport Systems - Third Edition

225 x 330 mm, 447 pp, several hundred half-tone illustrations, hard cloth covers. Janes' Publishing Company, 238 City Road, London EC1V 2PU, England. UK price Pounds 48.50; probably around \$95 locally.

Once again the latest issue of Jane's Urban Transport is all that you'd expect it to be - including the price. Since **Network** last reviewed this hardy annual its scope has been expanded to pick up the contribution of water transport in several of the world's cities, Sydney included. Of the Australian city entries, going clockwise round the coast:

**Brisbane's** contribution is well put together both for the BCC buses, which you'd expect from a totally dedicated bus manager like Dr Ken Davidson, and for QR which adequately reports impressive suburban electric system performance and extensions. Once again the **Sydney** entry could be made more exciting, especially on the railway side which deserves a later picture than that often published Comeng 2-decker disappearing onto the Harbour Bridge.

**Canberra** has no trains but its bus entry befits a system that loses \$14.1m annually or 68 cents a customer in the gracious, spacious and professional manner of our National Capital.

**Melbourne** has a comprehensive entry from the MTA reporting developments for all modes, as does **Adelaide's** STA, which waxes rather lyrical on the O-Bahn bus and contains new pictures of the heavy concrete beamway track. It looks every bit as expensive as a reserved-track tramline sans overhead and (dare we say it) several times uglier. Like Sydney's, Adelaide's train photo is becoming over-exposed by now. **Perth** reports adequately, duly noting the reopening of the Fremantle suburban line.

**Urban Transport** gives the following figures for farebox revenue as a percentage of total operating cost (in most cases for the buses and for

the year 1982/3) **Brisbane** 38%, **Sydney** 48%, **Canberra** 22%, **Melbourne** 43%, **Adelaide** (total system) 28% with "other commercial sources" adding another 10% (whatever do they sell - and can others do it too?). **Perth's** revenue is 39% of operating cost, and Darwin still doesn't get a guernsey.

On the manufacturing side, all four leading Australian train makers are listed. But Comeng's photo is blurry and Clyde, which bravely claims to build diesel multiple unit cars, doesn't have a picture at all. Stone-McColl remains the only listed railway equipment supplier offering its wares, but Australia's bus-builders have now got their act together and eight firms are listed in Jane's this year.

In contrast our signallers and our consultants (who are now allowed to advertise) remain coyly anonymous and unlisted. And in case you didn't realise - yes, Australia **does** have its own microprocessor automatic fare collection technology.

The entry for Associated Electronic Services, a Perth-based "sunrise" industry, reports sales to Singapore and Hong Kong, and negotiations in the USA and Canada as well as here at home. Good for them.

The editing and production standards are of Janes' traditionally excellent quality. **Urban Transport** remains indispensable for a balanced outlook, if not for a balanced budget, in the urban railperson's office library and has to be **highly recommended**.

## "Railmotors and XPT's"

Published by Australian Railway Historical Society.

144 pages - 200 approx. photographs.

Recommended Retail Price \$19.95

Readers of **Network** will recall a series of articles in recent issues which dealt with the development of rail cars in Australia. There is something about self-propelled units, their development and history, which gives them a special place in railway lore.

In this present work, author David Cooke describes in detail the railmotors, railcars and self-contained trains which have operated in that System from 1919 to the present day. His introduction briefly touches

on early self-propelled vehicles in Australia and a brief concluding chapter refers to railcars in other States, but with NSW origins. Likewise, reference is made to three vehicles operated by the South Maitland Railways System in NSW's Hunter Valley.

The book is noteworthy for the exceptional clarity of its black and white illustrations. Taken from both official and private sources, they depict each type of unit which has operated in New South Wales and are well captioned. Unfortunately, the colour photographs tend to suffer in tonal quality.

For the technically minded, one chapter is devoted to a description of the engines, transmissions, braking and control systems of the NSW units.

Within the 65 year span covered by this history, a large number of railmotor types and variants operated within New South Wales. In consequence, the text requires detail and your reviewer found that this added to reading difficulty at times. All historians face a dilemma in deciding whether to convert the original imperial units of measurements to metric, and the exact conversions used by Mr Cooke again present a difficulty. However, as a detailed record of a genus of passenger rolling stock in New South Wales, this volume deserves a place on the library shelves of all enthusiasts.

## Signalman's Morning and Signalman's Twilight

(Adrian Vaughan. Pan Books, London and Sydney. 132 x 196mm, 380 pp plus 8 pp half-tone illustrations. (Paperback). Two books in one volume, \$8.95)

We close this year's bookshelf on a high note.

This paperback was purchased at a station bookstall to while away a 17 hour train journey - one of those rare occasions where your reviewer did not get a sleeper, and just about everything went wrong. The coaches were shunted in late, the train dropped a further 75 minutes, problems on the (replacement) buffet car meant that a proper dinner and breakfast were off, beer and water ran out some eight hours before reaching our destination.

# from Australia and the U.K.

Only the kindly, solicitous (and highly embarrassed) railways staff, and this book, saved the day. Adrian Vaughan joined the Western Region of British Railways as a junior porter at age 16, when that railway was still the Great Western to its many loyal patrons and The Company to its equally loyal staff.

After a probationary and training period in Challow in the very rural Vale of the White Horse, he was posted to the adjoining station at Uffington, where as a Class 2 Signalman, aged nineteen, he held the responsible job of signalling and with his colleagues regulating, over forty main-line trains per shift.

These ranged from the famous 150 km/h **Bristolian** to a humble pick-up goods that worked the sidings along the Vale and was known as **The Fly**. Vaughan seems to have enjoyed himself immensely, and he has a happy knack of conveying that in **Signalman's Morning**, the first of the two books in this volume.

In the late 1950's the U.K. Brunel's London-Bristol main line was busy, the unhappy **Warship** and **Western** Class diesel-hydraulics had still to be delivered, and the line was still very much the traditional G.W.R.

The top-line engines were still green; their coaches had gone back from post-Nationalisation custard-and-red to the ageless G.W.R. chocolate and cream; an endless procession of Swindon's classic Churchward-type 4-6-0s. **Kings** and **Castles, Saints** and **Halls** hurried the stately expresses past Uffington Box to South Wales and the West, much as they had for two previous generations.

The author describes the daily routine of these wayside country stations in a simple, unpretentious way but with a real feeling; the Railway and the job were as ageless and unchanged as the beautiful Vale itself. But in the setting of **Signalman's Morning** nobody knew that the Western was trying its very best to do the wrong job, losses were becoming intolerable, and that time was running out.

What made the Great Western great? Vaughan has the answer in one word: people. The people who built it ran it; the passengers who swore by it and not at it; the shippers who despatched upon it wagonloads of incredibly diverse

goods traffic, even from rural places like this.

Vaughan introduces you to some splendid characters - all real people. There is Mr Halford, the Stationmaster who always put on his Very Smart Hat for the 8.58 a.m. Up, which called at Challow every morning to take the Very Smart People to **Peddington**, in a receive-and-despatch ritual that kept the Company Spirit alive for another day. Or Elwyn Richards, the Welsh signalman who waited five years through the Depression for a railway job, and taught the author that job so well. Sid Tyler, Adrian Vaughan's relief Signalman, who had joined up at 14½ and fought with the Wiltshires on The Somme before his seventeenth birthday. Mr Pearlman, the august but kindly Divisional Superintendent at Bristol (Temple Meads) who required to personally "vet" the author, even though both Mr Millsom, the District Traffic Inspector, and Mr Wellman, the Chief Inspector, had scrupulously tested the young probationer on the Rules.

Local people, drivers; gangers, porters, all are there. Even the Duke of Edinburgh who, when the Royal Train was stabled at Uppington for the night (with its special monogrammed chamber pots carefully positioned under the coaches) was wont to stroll across to the signalbox for a pre-breakfast cuppa and chat, but too polite to ask could he work the levers or bell a train through.

General Manager to porter, Duke to school children - all were part and parcel of a railway where, on the third successive Wednesday morning that you had breakfast on the 8.45 from Paddington, the dining-car staff had somehow contrived to find out who you were so that they could welcome you aboard by name. Such was the Great Western.

In **Signalman's Twilight** it is 1962 and the Western Region is in deep water. Their diesel-hydraulics are chronically unreliable, but the old Swindon 4-6-0s, even though many are on their last legs and some even pulled back from the scrap road, are still performing superbly as stand-by engines to thrash the expresses through on accelerated schedules. The stricken railway is

somehow kept running, but time has run out.

Finally, Dr Beeching is moved in. "New" people from Board Headquarters arrive rather insensitively, in chauffeur-driven Bentleys. They take a quick look around; they give instant decisions. The train service is wound-down and the local patrons are driven away - shippers, schoolchildren and the Very Smart People. For now there is no 8.58, no local train service between Didcot and Swindon. The station is shut, the signalling goes CTC, the handsome boxes are demolished and in what seems to have been a singularly inept piece of industrial relations, the people are sacked. The block bells are silent; nobody is left to shepherd the trains from box to box along the Vale of the White Horse, or to beat out seven bells - stop and examine train - when an alert signalman notices something amiss.

As a passenger one always felt wanted on the Great Western. And on no other railway has your reviewer ever felt as safe - even when rocketing through dense fog on a steam engine at 150 km/h, with semaphores invisible and the driver relying on the clear bell cab-signals of the ATC apparatus. Vaughan's book breathes the character of this railway from the grass-roots level. True, British Rail's **Inter City 125** expresses of today are superb, the trains on Brunel's splendidly-aligned main line are 40 percent faster, and the service in the dining car (if you can afford it) is still top-class.

The Western Region railway people are still softly-spoken Wiltshire and West Country and Welsh folk and many wear Great Western tie-clips (which they buy themselves). BR people still care, and it still shows. But somehow, it is not quite the same.

This inexpensive paperback makes enjoyable and nostalgic reading for every railwayman, especially for people in the Traffic.

For those who claim a particular pride in the railway service, who are admirers of the steam locomotive, or who were privileged to ride on the old Great Western Railway, it is definitely required reading.

\* Highly recommended.

\* Best value railway book for the year 1984.



# 'A life apart' for V/Line's timber cutters

The country is flat and in the early spring the paddocks are green. Flocks of cockatoos suddenly emerge from the trees in a flutter of white and the jumbucks take their chance with passing cars and trucks as they dart across the dusty roads. The trees which creep up from the horizon, almost to the edge of the road in some parts, are straggly gums, hardly the stuff of forests, but this is river, not rain forest, country and this is where the red gums grow.

The peculiar stillness of the Australian bush is broken by the sounds of chain saws. We are at Wakool, which, if you peer hard at a map of New South Wales, you will find half-way between Deniliquin and the border town of Barham on the Murray River, and this is one of 32 loading locations where cutters, on contract to V/Line, fell the timbers which are sawn into sleepers for its network of track.

Over 400,000 timber sleepers are used each year, largely for the maintenance and upgrading of track by V/Line's mechanised track gangs. Sleeper size varies between lengths of 2650mm for standard gauge and 2750mm for broad gauge track, with both types 250mm wide and 125mm thick.

Timbers used are stringybark, grey and red box, ironbark and red gum. The main sources of supply are the Orbost, Wangaratta, Picola, Murchison East, Nagambie, St. Arnaud, Echuca areas and here along the Murray River where red gum accounts for most of the sleepers.

Twenty-five cutters are contracted to V/Line for the supply of sleepers from the Wakool district alone. Their work is checked by Kevin Black, one of four timber inspectors employed by the railways to check the quality of these wooden beams which run transversely across the ballast, and both support and keep parallel the rails which are fastened to them.

In the early days stone blocks were used with suitable fastenings to hold and keep the rails in line, but lack of elasticity as well as high cost, inconvenience and difficulty of

keeping the track true led to their replacement with wood.

Timber beams were first laid longitudinally on the ballast and spiked to the rails, but although this method gave continuous support and permitted the use of a lighter rail than before, maintenance and handling difficulties led to the adoption of today's cross-tie or sleeper.

Licensed by the Forestry Commission and under contract to V/Line to supply a maximum of 200 sleepers over a four-week period each year, most cutters work in two's and three's, often in family groups. It's a life apart, this work in the bush. Many cutters have been under contract to the railways for years like brothers, Ray and John Granger, who have spent most of their working lives as cutters in the Wakool district, where the contractors here recently formed a co-operative to buy a crane for the loading of sleepers onto rail wagons. Kevin's 'territory' covers St. Arnaud, Wycheproof, Inglewood, Maryborough, Dunolly, Bealiba, Goornong and Murchison East where he spends a day checking that the timber is true to type, that it is the correct size and that there are no other flaws, such as rotting or splitting of the wood.

Cutters work either on Crown land, where the trees considered suitable for felling are marked by forestry officers, or on private property. In both cases the Government or the owner receives a royalty on each sleeper produced from the trees.

The contractors usually drive deep into the bush to find the timber required, hauling the logs back by tractor to their 'dump'. In the terminology of the trade the tree trunks are 'broken down' or shorn by saw of their curved sides so that the logs are ready for the spot mill to saw into the required thickness and width.

If too long, the slabs are docked with a chain saw. Offcuts are generally sold as firewood and those sleepers that are rejected by the railways are sold to nurseries where they are in great demand by landscape and home gardeners.

The sleepers are carted by truck from the dumps to the station yard where, after checking, they are loaded into special containers on KMQ wagons for delivery wherever they are required by gangs throughout the State.

At Wakool a consist ranging from anything from six to 13 wagons is attached to trains travelling from the rice and wheat growing areas of southern New South Wales at Moulamein, Balranald and Burraboi into Victoria.

As mentioned earlier a vast quantity of these sleepers is used by the network each year, largely for track maintenance. However, an increasing number of concrete sleepers are being used for the construction of new track, particularly in the metropolitan area where difficulty of access and restricted time available for maintenance make them a more attractive proposition.

Concrete sleepers may also be eventually used for upgrading of the more heavily trafficked main lines, such as the Melbourne-Albury standard gauge route.

With this in mind it may not be unrealistic to forecast that the concrete sleeper, despite its present high unit cost, may eventually replace the timber sleeper to a somewhat greater extent than has already occurred, especially when it may be considered less acceptable to fell and employ the slowly regenerating indigenous forests in the years to come.



# Head hardened rails



The Broken Hill Proprietary Co. Ltd. has traditionally invested heavily in Research and Development within all of its areas of activity. In the current year BHP will outlay approximately \$40M for Research and Development; a significant proportion of this expenditure is channelled into the Steel Division, particularly in the Rail and Rail Track material sphere in the areas of engineering technology, metallurgical technology and production technology.

The hub of BHP's railway technology resources is its Melbourne Research Laboratories (MRL). The Railway Engineering and Materials Group within MRL has become a world leader in the field of high density, heavy haul railway technology.

#### **Liaison with Industry**

A multidisciplinary team of mechanical, civil and materials engineers works in close liaison with several railway operators and

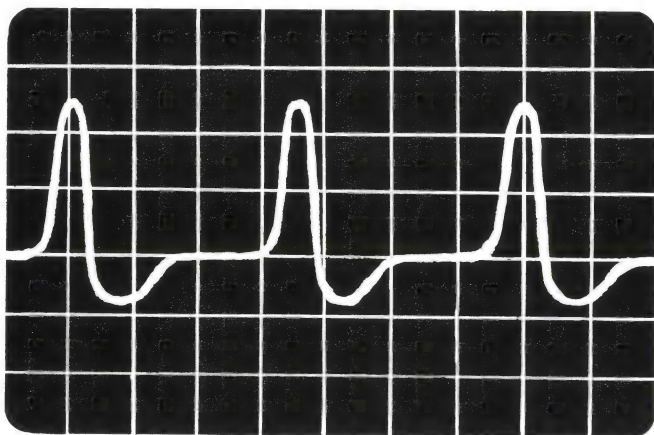
component manufacturers. The Group undertakes work in the general fields of railway component development and testing, vehicle and track performance and maintenance economics.

MRL have made major advancements in the areas of:

- Rail and wheel steel development.
- Wheel/rail interaction.
- Welding technology.
- Railway vehicle dynamics.

*(continued on page 53)*

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(continued from page 35)

## Focus on Perth and Pilbara

These include the use of galvanised spring steel "shims" to hold a loose spike into its hole, and a one-twist square track spike which is semi screw-spike, and an interesting application of offcut pinus radiata (two 125 x 125mm sections, side by side and dowelled and glued together to form a composite 250 x 125mm sleeper).

The mechanical engineers spent an interesting morning at Midland Works, where they were shown through all shops. Midland is traditionally a very versatile plant (arising from Perth's isolation) and as well as repairs to all Westrail equipment makes a number of items most other railways purchase, including such diverse items as furniture, couplers and cast manganese steel point crossings. Members were particularly impressed with the batteries of modern NC machines in the machine shop and at the opposite end of the spectrum - some beautifully maintained but still very efficient mechanical air compressors with loco-like valve gear, providing the shops' air supply. Guides reported that the last-ever repairs to four-wheel stock were in hand and most work on timber wagons was likewise winding down. A novel conversion of old narrow-gauge box cars and opens to end-tipped wheat wagons was also of great interest to visitors from the Eastern States.

In the afternoon, members saw the dual-gauge Forrestfield yard and diesel loco facility while the signal engineers were shown modern CTC installations on the South West line. On the final Saturday morning a number of members visited the Perth plant of ACE-T Pty Ltd, the "sunrise" electronics firm that had done most of the work on mid-train buff and draw forces, the train driving simulator and loco logging. Members were also privileged to be shown on a confidential basis, a number of "new-generation" railway projects still under development.

This typified the openness with which all the Western Australian railway engineers who were met received their visitors, and the quiet but justifiable pride with which they showed their splendid technology, much of it leading the world in heavy-haul railroading.



(continued from page 51)

- Track design.
- Track and vehicle economics.
- Track and vehicle modelling.
- Sleepers, rail fastenings and insulation systems.
- Track maintenance management.
- Ultrasonic inspection.
- Universal rolling.
- Fully killed steels.
- Roller straightening.
- Head hardening.

#### Electrification masts research

Significant research has also been directed to the development of a design for galvanised railway electrification masts manufactured from universal sections. This new mast collects such advantages as simplicity of design and economy of material, increased engineering performance in terms of deflection and working load and long life with low maintenance. MRL have subjected the new mast to an extensive testing program which proved the design to be an excellent alternative for overhead electrification equipment.

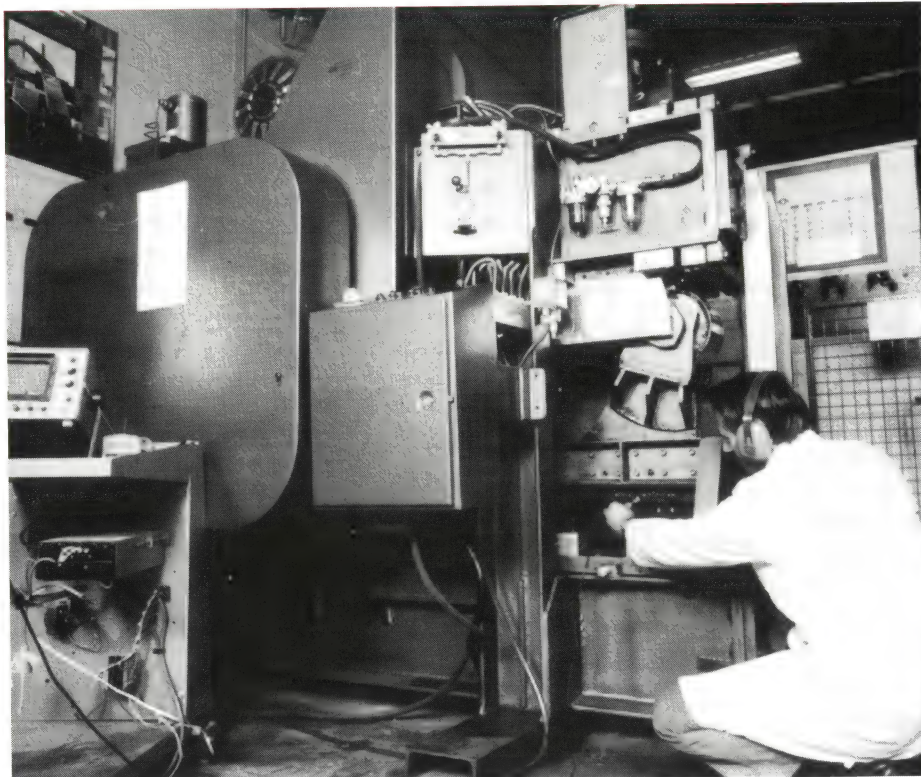
#### Rail Manufacture at Whyalla

Rails are manufactured by BHP at its Whyalla, South Australia steelworks. The rail plant and rail finishing end incorporate the most technologically advanced equipment in the world.

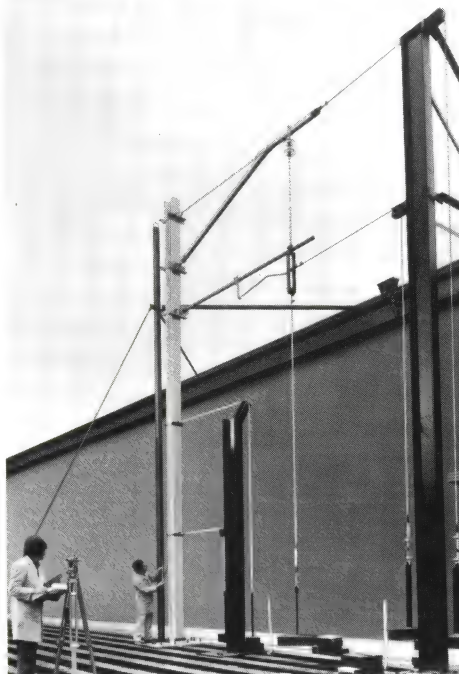
Permanent way rails are manufactured by the Universal rolling method. This method reduces the steel bloom symmetrically so that the finished rails, and particularly the rail head, exhibit superior properties to rails produced by other methods. Universal rolling improves surface quality, and dimensional accuracy which consequently reduces welding problems.

Fully killed steel is used for manufacture of BHP's rails. The rail blooms are control cooled to reduce hydrogen content and inspected prior to reheating for final rolling. When final rolling has been completed, all rails are roller straightened. This process produces a consistently straighter rail than by the older gag pressing methods. After straightening, rails are ultrasonically tested over the complete length of the rail to guarantee a high level of internal soundness.

BHP is one of only three rail manufacturers in the world who produce Head Hardened Rails and one of only two who produce Head Hardened, Universally rolled rails.



Monitoring fatigue on rails.



Testing BHP's Column Master.

#### Head Hardening Technology

In Head Hardened Rails the head of the rail is induction heated in a two stage process, electronically controlled, then rapidly air quenched.

Head Hardened Rails find their application in high axle load operations where rail corrugations and fatigue may develop and in situations or conditions which demand expensive maintenance/replacement operations e.g. curved track, and/or restricted access locations. The extended life of these

rails reduces the amount of maintenance required and considerably extends the replacement cycle.

BHP Head Hardened Rails are now in service in the following operations.

- Mount Newman Mining Co. Ltd - under 32.5 tonne mean axle loads carrying approximately 50 million gross tonnes per annum.
- Hoskins Kembla Works of Australian Iron and Steel Pty. Ltd. - under 50 tonne axle loads.
- Kooragang Coal loader - under 25 tonne wheel loads.

Over many years, improvements in flash butt welding and aluminothermic welding techniques have greatly advanced track standards and have consequently reduced track maintenance costs. Usage of Head Hardened Rails has precipitated further advancements in rail welding technology. "Normal" welding of Head Hardened rails results in an average hardness in the heat affected zone which is considerably less than the hardness of the parent metal. This lower hardness is due to the transformation of the rail steel occurring at a cooling rate much lower than that achieved during the original head hardening operation (the final hardness of the steel is a function of the cooling rate during transformation). Such a hardness difference can lead to differential plastic deformation of the material subjected to wheel/rail contact and

can also cause localised dipping on the welds; this in turn enhances the development of several deleterious track characteristics, including:

- high wheel/rail vertical impact forces.
- high rates of sleeper and ballast degradation.
- higher rates of track geometry degradation.
- rail surface corrugations.

## Flash butt welding techniques

To avoid the above problems, an alternative procedure has been developed for the flash butt welding of Head Hardened Rails. The procedure consists of air quenching the head of the welded rails after the excess metal is sheared from the weld, as shown in figure 1. The air quenching is effective in increasing the cooling rate and consequently the hardness of the HAZ to match that of the parent rail.

## Steel sleeper developments

BHP have also invested heavily in upgrading the technology of steel sleepers. Steel sleepers have been in existence for many years, however, BHP steel sleepers have been designed from first principles and have undergone a demanding testing program taking into account loading conditions, fatigue aspects at the rail seat area, track maintenance conditions and environment.

BHP have developed four basic steel sleeper designs to suit a range of operating conditions.

Steel sleepers being only 20% of the mass of concrete sleepers can be installed at a rapid rate without expensive large scale equipment. Also, because steel sleepers are designed to "nest" within each other when stacked, handling and transport are greatly facilitated. A number of elastic fastening systems have been developed for steel sleepers. These fastenings exhibit low maintenance properties and enable consistent gauge to be maintained.

## BHP and Railways

BHP's involvement in the Railway industry has grown over almost a century as a producer of railway materials, a railway customer and a railway operator in its own right. BHP's assessment of the importance which the Railway industry holds to its interests is manifested by the emphasis which has been placed on maintaining an enduring and extensive technological involvement in the railway world.

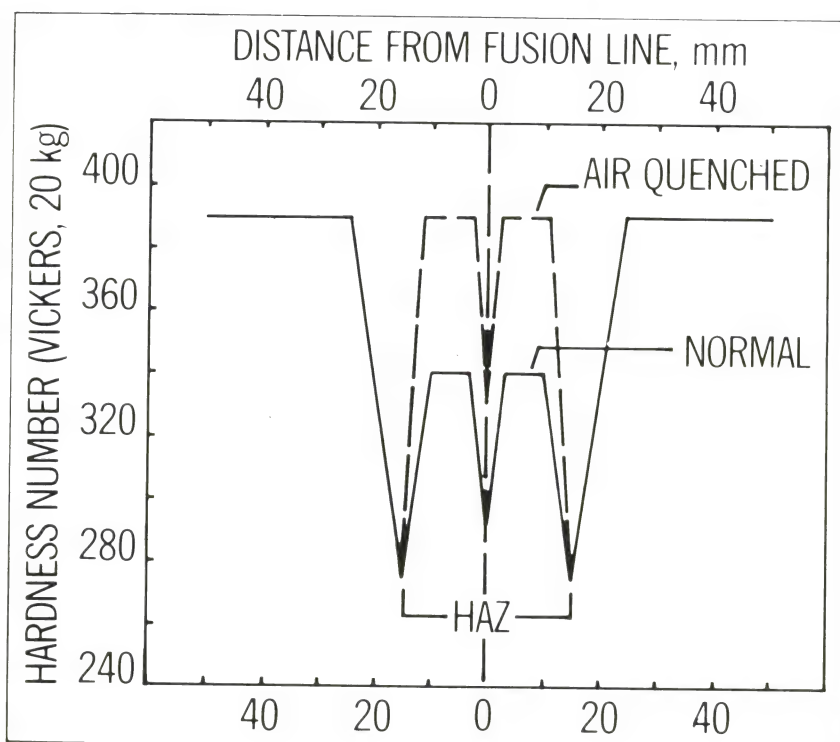
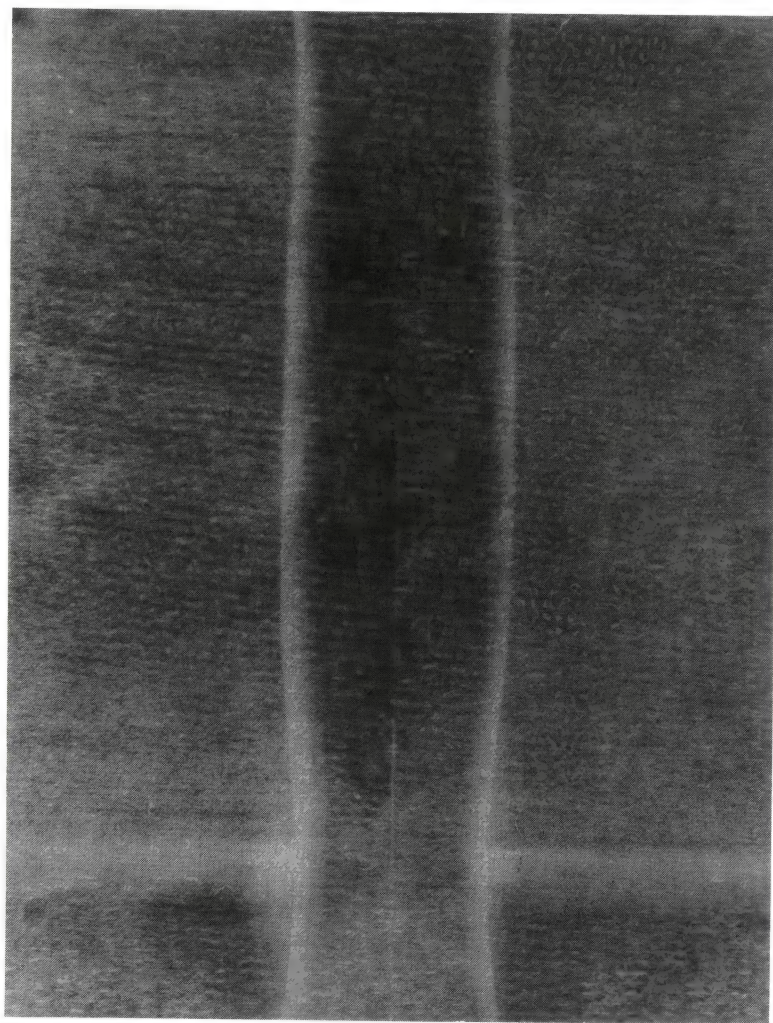


Figure 2: Heat affected zone and hardness distribution in flash butt welded head hardened rails. (Actual Results).

**A**ustralian railways operate some of the finest, best equipped interstate long distance trains in the world. Yet patronage on most is now being affected by unprecedented competition from road coaches, airlines and the private car. Coupled with this competition is a change in passenger attitudes and buying trends: at the opposite ends of the spectrum are demands for speedier point to point travel and a requirement for travel at minimum cost with little regard to minor inconveniences.

Is rail meeting the challenge of these changing travel trends? How can it improve its marketing against road and air competition? Is the rail travel product appropriate to the needs of today's travellers?

These are some of the important questions now facing Australian railway systems and they are looking to each other to learn from their experiments and experiences.

Australian National, which with V/Line jointly operates the Overland between Melbourne and Adelaide, is involved in running more interstate services than any other Australian system.

In addition to the Overland, AN runs the Ghan (Adelaide-Alice Springs), Trans Australian (Adelaide-Perth), Indian Pacific (Sydney-Perth with Adelaide connections) and The Alice (Sydney-Alice Springs with Adelaide connection).

Therefore the effects of, and reaction by AN to this challenge holds some keys to the future of the rail passenger market.

In recent years, AN's services have

been hit hard by the competition. But AN is meeting this challenge and with some signs of success.

Perhaps the greatest impact on rail services has been caused by the proliferation of unregulated interstate road coach services over the past decade or so.

This is shown by statistics which indicated that rail now has only 10 percent of the interstate market, while coaches carry 25 percent and airlines the bulk, about 65 percent.

Low fares, greater frequency of services, minimal disruption by industrial disputes and steadily improving highways have successfully lured customers of all ages onto road coaches - and especially the younger generation - from trains, planes and cars.

Intense competition between the coach operators, each using well

# FACING COMPETITION

by Ian Hammond



Above: The Indian Pacific near Yorkey's Crossing north of Port Augusta.

## passenger

equipped coaches has only intensified the promotion of low fares and fast, frequent schedules. On the cheaper coaches, passengers have accepted the inconvenience of disorderly comfort stops, rushed meals and little room to move, in exchange for personal attention from coach captains and fast, very economical travel.

While the impact of road coaches has been steady on the Australian East Coast rail routes, the long transcontinental services have suffered surprisingly, considering the long distances and time involved. For AN, the impact of coach competition was most obvious after the completion of sealing of the Eyre Highway. East-West rail patronage fell drastically while the number of coach services crossing the Nullarbor rose from a mere dozen or so to a current level of about 60 per week, each averaging about 70 percent occupancy.

No-frills coach fares have dropped as low as \$59, about \$45 less than the rail fare.

Not surprisingly, AN is anticipating a similar upsurge of road coach services on the Adelaide-Alice Springs route when the Stuart Highway sealing is completed in 1986.

Already the number of coach services is increasing, but such is the lure of the Red Centre that the 'Ghan' train is continuing to be heavily patronised.

In fact the Ghan, of all AN's interstate services, shows best recovery of costs, and has increased patronage from 11 900 in 1979/80 to 32 200 in 1982/83.

It was the successful experiment of using sit-up coach class on the Ghan which led to AN's similarly successful introduction of coach class on the east-west transcontinental route.

In each instance, the coach class fares competed well with the big name coach operators.

The success of coach class is undisputed, yet when tried 20 or so years ago on the Trans Australian, it was a dismal failure. Such is the changing attitudes of many travellers, who now seem to be rating the cost of travel above the experience, convenience and comfort.

An interesting point is that when something is not up to standard on the rail service, the operator is always blamed. But the road coaches rarely get the blame for poor (or non-existent) terminals, bad meals, poor public toilet facilities or any of the other hassles of travelling by road!

Despite the success of coach class on the Alice Springs and Perth services, AN believes that more can, and must, be done to make rail a more attractive choice for economy-travel seekers.

Following the successful introduction of video into the lounge cars on those services, AN is studying the

feasibility of installing video into sitting cars.

The Overland is typical of the overnight intercapital trains suffering the effects of competition. A slow downturn over the past decade was accentuated in 1982/83 by rail industrial disputes and a substantial drop in road coach fares.

With up to 57 coach trips each way every week, road offered a better range of travel times and the attractive option of daytime travel for tourists.

The coaches reduced travelling time from 13 hours to about 11½, and it was not until through-working of AN and V/Line locomotives and the opening of the new Adelaide rail passenger terminal in May that Overland schedules could be reduced to a fairly comparable 12 hours.

The trend has been arrested over recent months as the new CAPER fares, introduced on 20 February 1984, and faster travel times take effect, aided by a substantial \$60,000 promotion campaign.

From a low of 46 933 passengers between February-June 1983, a recovery to 56 538 (an increase of 9,600 passengers) has been achieved during the same period in 1984.

The same effects can be expected from the operation of CAPER fares on the Sydney route and recent extension to cover the whole eastern seaboard line.

To further improve the already good standard of sleeping and sitting accommodation, AN and V/Line are examining the feasibility of providing better soundproofing and carpets. Video, five-channel piped music, and improved recline and tilt seats with greater legroom are also under consideration.

AN is mindful too that the private car accounts for 40-45 percent of total interstate travel, and has been successful in its promotion of Motorail services between Adelaide and Melbourne, Perth and Alice Springs.

But now one coach company has entered into an agreement with a trucking company for transport of coach passengers' private cars to Perth, enabling travellers to have the use of their own car on arrival at their destination.

With 85 percent of its 260 000 annual travellers journeying on holiday to visit friends or relatives, AN does not believe that total travel

(continued on page 58)



Economy Coach Class on the Ghan



Above: Dining Car on the Indian-Pacific.  
Right: Economy Class Lounge on the Indian-Pacific.  
Main: Video in First Class Indian-Pacific Club Car.



# challenge

(continued from page 56)

time of long distance trains is particularly critical to its present day markets.

What is critical is that the service is reliable and practical, and arrival times are appropriate to passengers' needs. They are fun trains, and must be perceived by passengers and staff in that way.

For that reason, increasing the running speed of trains or building new high speed trains is not necessarily the answer to the problem of competition.

Rather than spending large sums installing high speed bogies, upgrading track and on higher rollingstock maintenance costs to speed up a service by a few hours, AN believes it is better to consider upgrading on-train services to make the journey more enjoyable than other modes.

The massive investment required to introduce high speed trains such as the New South Wales XPT to all interstate services is obviously out of the question - and in the view of AN, unnecessary for transcontinental journeys where air services cater best for travellers requiring minimum time en route.

On the Sydney-Melbourne corridor, however, the XPT does offer considerable potential for beating the competition from road coaches by reducing travel times and increasing comfort and facilities.

Until AN can achieve its existing potential of 500 000 passengers annually, it believes massive expenditure on new trains cannot be justified. It does consider that level to be achievable, providing the proper market is sought.

AN points out that because of the great distances to be covered in Australia, we use our trains for different purposes than in Europe, Great Britain or Japan, where trains are more heavily patronised for business purposes as well as holidays.

In a country the size of Australia and with such a low population, it is inappropriate for rail to seek out the time-sensitive market which is more adequately served by airlines.

Air has had the bulk of this market for many years, and the number of businessmen prepared to travel overnight between capitals by train or coach is now minimal. For that reason AN does not see any real competition from airlines for the time-critical market.

It is true that the airlines are offering many forms of discounted fares which are indeed very attractive to holidaymakers, being cheaper than rail in many instances. So, in the holiday travel market there is real competition and to meet the airlines' holiday packages head-on requires substantial marketing and promotion of the enjoyable experience, comfort and relaxation of a journey by rail. After all, what other mode of transport can offer comfortable beds in a private room with en suite facilities, a lounge car with bar, piano and video films, and a mobile restaurant offering top class service and four course multiple choice menus?

And the total cost for such a three day fully serviced holiday while travelling across Australia is very comparable with an air fare and the three days spent in a hotel.

AN prefers to work in conjunction with airlines by supporting holiday packages which provide fast air travel in one direction and the easy-paced comfort of returning by rail.

Considerable potential is also seen in promoting rail travel to some overseas markets, and this was facilitated recently (June) when AN carried 110 overseas travel agents on the Ghan to Alice Springs, with encouraging results.

AN believes that about 20 percent of air travellers do not fall in the time-sensitive category, but they are not choosing to travel by rail because they are unaware of rail

services and the standard of meals and comfort provided.

Another perceived constraint is that Australians tend to plan their holidays many months in advance and do not want the risk of an industrial dispute upsetting travel plans. For that reason overcoming the stigma of unreliability (whether a fact or perception) is a major task confronting all rail personnel.

AN therefore sees improved on-train comfort and facilities, better marketing to increase public awareness of the benefits of holiday train travel, and a reputation for reliability as the three necessary ingredients to support economical fares in wooing the traveller from other modes.

Looking further ahead to the possibility of a standard-gauge Adelaide - Melbourne link, AN sees the possibility of the Ghan and maybe the Trans Australian originating in Melbourne, a city of far larger population and therefore considerably more marketing potential than Adelaide.

And what will the train be like? Probably the same as today's. For sleeping car passengers, a top class hotel and restaurant on rails, with quality of service paramount. For coach class passengers, economy of travel, comfort, room to move, and far more on-board facilities than the road coach will ever offer.



A First Class twinette during day use on the Indian-Pacific.



Hugh Smith

## QR appoints new 'admin' manager

Mr. H.W. (Hugh) Smith is the newly appointed Administration Manager, in the Office of the Deputy Commissioner and Secretary. He replaces Mr. Allan Evans who was recently appointed Chief Supply Manager, Redbank.

Mr. Smith, formerly Personnel Manager, has been a member of the Department for 41 years. His career started in Cairns. Mr. Smith was involved with the introduction of the computerised management system for personnel and played an important role in the planning of the rail haul of West Moreton coal to Fishermen Islands as well as assisting in the planning of other major mineral projects.

Mr. Smith's experience comes from both the range of positions he has held, and the training he has received outside the Department.

His first management position came when he was Officer in Charge of the Operations Section, then moved through the Department occupying postings as Clerk in Charge, General Section, Senior Personnel Officer, and later to Senior Planning Officer (Operations). Mr. Smith completed the Transport Industry Executives Course, held at the University of New South Wales, and is a member of both the Chartered Institute of Transport, and the Institute of Personnel Management, Australia.

## Monorail system for Expo '86

VANCOUVER — The Honourable Claude Richmond, Minister of Tourism/EXPO 86 for the Province of British Columbia recently announced that EXPO 86 has awarded a \$10,580,000 contract to Von Roll-Habegger Ltd. for the construction of a 5.6 kilometre monorail system on the False Creek site.

The sleek trains will traverse the Expo site at an elevation of 5 metres, giving passengers a panoramic view of the more than 80 international and corporate pavilions, shops, theatres, and on-site festivities.

At an average speed of 20 kilometres per hour, one complete circuit of the site will take twenty minutes. With six stations en route, Expo visitors will have easy access to the system itself and to the variety of attractions on the site.

The monorail has a capacity of 3,000 passengers per hour round trip. It is a quiet, completely automated, well proven system driven by electric motor. Each of 10 trains carries a maximum of 100 passengers.

In addition to the six stations on site, the monorail will connect with the ALRT system at the Stadium station, allowing guests to travel to the Canadian Pavilion on Burrard Inlet. The trains, developed for EXPO 86, are a prototype with the coach design being exclusive to Expo. The aerodynamic design will make the monorail itself an exciting symbol of the transportation theme of the 1986 World Exposition.

## Monier awarded huge sleeper contract

The Minister for Transport, Mr Peter Morris, announced recently that an \$18.5 million contract had been approved for Monier Ltd to supply 700,000 concrete sleepers to Australian National (AN) over a three-year period.

The contract should enable the company to bring its Port Augusta plant back into production, which would mean more jobs for the local areas.

Tenders were called in January for the sleeper contract which would be funded under AN's 1984/85 annual and forward capital works program. AN's existing stockpile will be used over the next year. They therefore decided that it would now be appropriate to place the contract for the new sleepers.

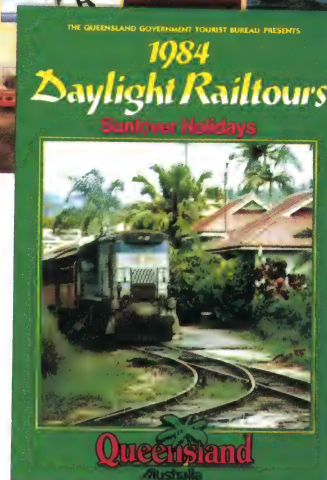
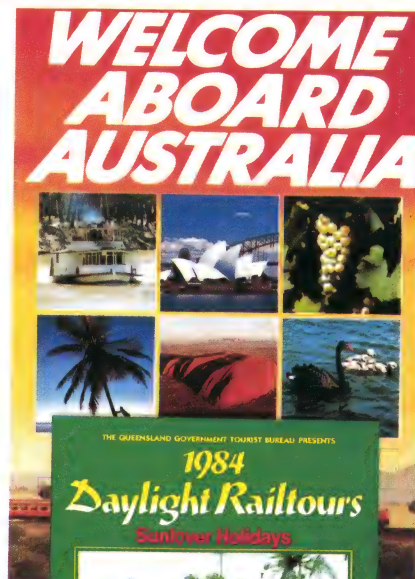
The current stock will be used for the normal replacement schedule as well as for the projects under the Community Employment Program. The earlier delivery of sleepers to AN would contribute to further CEP projects being undertaken by the railway.

Last year some 130 jobs had been created in South Australia by the use of Commonwealth CEP money to accelerate re-sleeping of Trans Australian Railways between Woocalla and Port Augusta and in the Crystal Brook area.

Mr Morris also announced two further contracts for rail fastenings - one worth \$2.6 million for McKay Rail Products and the other worth just over \$1 million for Pandrol Australia.



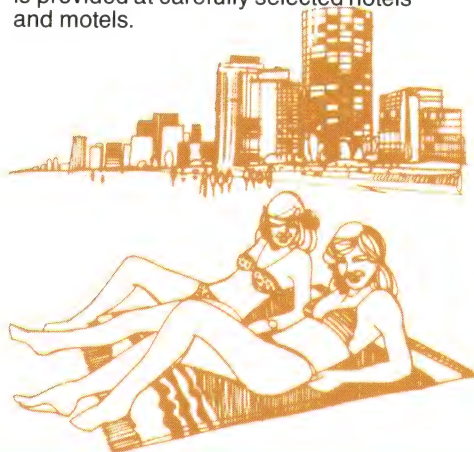
Mr. Peter Morris



## Railways' Packaged Tours... Carefree, Economical Holidays

Railways of Australia offer the traveller a wide selection of packaged tours covering travel, accommodation and visits to scenic highlights and major tourist attractions.

Of particular interest are the packaged tours featuring "The Alice" – the all first class service between Sydney and Alice Springs. These "Wonderland" series tours incorporate travel on "The Alice", coach travel or 4 wheel drive; or a combination of both road modes. Accommodation is provided at carefully selected hotels and motels.

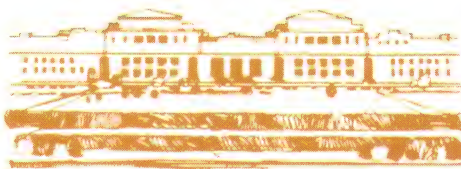


Choose from the following tours:



**State Rail Authority  
of New South Wales**

- RAIL STAY-a-WAY FARM AND COUNTRY (16 TOURS)
- RAIL STAY-a-WAY OUTBACK HOLIDAYS (6 TOURS) featuring "The Alice" – the all First Class service between Sydney and Alice Springs
- RAIL STAY-a-WAY SUN, SEA & SIGHTS (18 TOURS)
- RAIL STAY-a-WAY 'BIG AUSTRALIA' (10 INTERSTATE TOURS)



**State Transport  
Authority – Victoria**

- WELCOME ABOARD AUSTRALIA (24 Victorian Tours – 23 Interstate Tours)



**Westrail**

- WILDFLOWER TOURS – choice of 2 six-day packages
- WESTRAIL TOURS – 16 selected tours from three to nine days



**Queensland Railways**

- DAYLIGHT RAIL TOURS, COOKTOWN CLASSIC, 'REEF' SERIES TOURS

Ask for complete details where you book your rail travel.



**Railways  
of Australia**

An association of the five government owned Railway Systems – Australian National, Queensland Railways, State Rail Authority of New South Wales, State Transport Authority – Victoria (V/Line) and Westrail.

# Thoroughbred Performance on the Track



**Double Deck Suburban Passenger Cars** - State Rail Authority of NSW (manufactured with technical assistance from Pullman Standard, USA).

**C36-7 Diesel Electric Locomotives** - Hamersley Iron Pty. Ltd. (manufactured under licence to General Electric Company, USA).

**Diesel Hydraulic Rail Cars** - Western Australia Government Railways (manufactured with technical assistance from Pullman Standard, USA).

## GONINAN

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GRP/1/8216

# V/Line reveals Victoria's south-west

Travellers to and from Victoria's southwest can take advantage of a fully co-ordinated rail/coach service linking Melbourne and Mount Gambier in South Australia.

Designed for the regular passenger or the tourist out to enjoy the district's distinctive coastline and national parks, V/Line has introduced its own coach service between Warrnambool and this border city.

A day-return service, the coach links up with the Melbourne/Warrnambool train to take passengers on to Mount Gambier via Portland and Heywood. This is an important and busy route with many people from these major towns patronising this service. The new air-conditioned bus in bright V/Line livery operates on the same route as that previously taken by a private bus operator.

However, the new service is fully co-ordinated with the Warrnambool rail schedule and has been designed to link up with Australian National's train service operating between Mount Gambier and Adelaide.

The introduction of a V/Line coach service also clears up any price anomalies which had previously existed with one fare charged on the bus and another rate on the train. Passengers with access to V/Line's ticketing and booking system can now book one through-ticket for both the rail and coach service, if they wish.

Booking for both rail and coach services is compulsory as it is on all InterCity train services, but this means seats are automatically reserved on coach and trains once the booking is made.

In order to capitalise on this new service V/Line have opened their own booking agency in Portland. Situated in Henty Street this outlet handles all passenger bookings for all V/Line services and for an extensive range of package tours as well.

The opening of this agency, a first for V/Line, was scheduled for mid November when on 17th of that month the Premier attended celebrations in the State's oldest city to mark Victoria's 150th anniversary celebrations.

It seems an auspicious time for Portland at the moment. Industry has received a welcome boost with the go-ahead given for the Alcoa aluminium smelter and it is appropriate that V/Line is rationalising its operations to serve this growing community in the southwest.

Further information about both these services is available from V/Line Access on (03) 62 3115. Bookings can be made through V/Line Reservations on (03) 62 0771.

Meanwhile, V/Line is providing holiday travellers with the best of both worlds. That's how you would describe the series of Rail/Drive holidays recently launched by V/Line, a package which really sets us firmly in the travel business.

Enjoy the comfort of first-class train travel to the country or interstate, without all the hassles of navigating your car through city traffic.

Arrive refreshed at the station of your choice where you can pick up a hire car ready to begin your holiday, all the time knowing your accommodation has already been booked.

That's the message of this new package released by the Passenger Services Division, which promises "the relaxation of rail, the freedom of a car and the certainty of a great place to spend the night."

Just one phone call books the train berth, the car hire from Hertz Rent-a-Car and accommodation through Flag Inns.

Reservations can be made through V/Line Reservations, Victour, Stationmasters and most travel agents.

Travellers can leave their car free of charge at Spencer Street Station and pick up the keys for their hire car from the stationmaster at their destination.

These Rail/Drive holidays range from weekend breaks to those lasting several days, and with the flexibility of a car for touring will attract the whole tourist spectrum - from couples, families, and young groups, as well as the elderly tourist.

Prices are very competitive. The train ticket, car rental and accommodation couldn't be bought individually for the price of these package holidays.

First-class train travel, whether in a reclining armchair or a sleeping berth, gives passengers the freedom to move around when they feel like it and to buy food and drinks from the train's snack bars.

Children, in particular, who hate being cooped up, will be glad of the opportunity to travel without having to sit still.

Other pluses of these holidays include minimal baggage restrictions on trains, and unlimited car mileage.

Flag Inns, among the largest accommodation chains in the country, offers a choice of motels in each area.

Designed for all tastes, the holidays range from a weekend in Sale on Victoria's southeast coast to five days in Adelaide touring its neighbouring wine country.

They also include days spent using Mildura as a base visiting Echuca and Broken Hill or sight-seeing along the Murray River as well as rail/drive holidays of eight days, taking in Brisbane, the Gold Coast, Coffs Harbour and Sydney.

It is the unique blend of rail travel, car hire and the inclusion of motel accommodation that sets these holidays apart from our extensive range of package tours.

The provision of a hire car at the station destination has added an ingredient of flexibility which was not available to the rail traveller before and highlights V/Line's continuing development as a truly multi-modal travel organisation.



# Digitair.

## The only system you need behind you.

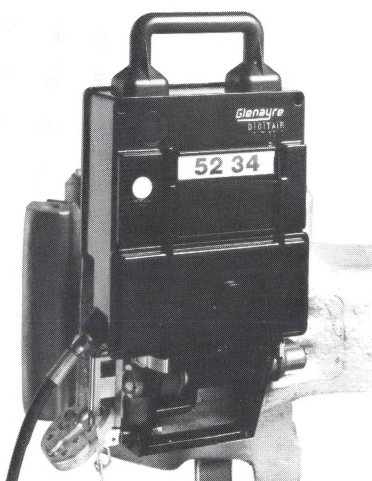
Glenayre's DIGITAIR system is your complete rear-of-train information system. It provides a visual locomotive display of conditions at the rear of the train.



GL6624 Receiver Display Unit

Basic features provided include:

- Locomotive display of brake pipe pressure at the rear of the train.
- Test button and digital air pressure display on rear unit.
- Locomotive display of rear unit battery "weak" and "fail" conditions.
- Loss of communications warning in locomotive.



GL6621 Sense and Transmit Unit

Options recently added to the basic system comprise:

### Motion Sensing

- conditions monitored are:
  - Moving/Stopped
  - Forward/Reverse
  - Buff/Draft

### Odometer

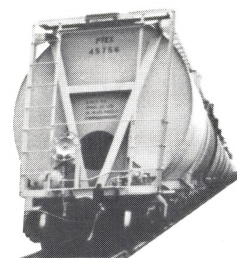
- provides a locomotive display of distance travelled
- can be calibrated en-route.

### Rear Marker Light

- the rear unit can be equipped with an integral FRA standard marker light.

With its innovative microprocessor based design, sophisticated data communication techniques, rugged construction and long battery life, DIGITAIR provides the best communications performance in the industry, performance that is field proven.

**DIGITAIR, the only rear-of-train system you'll ever need.**



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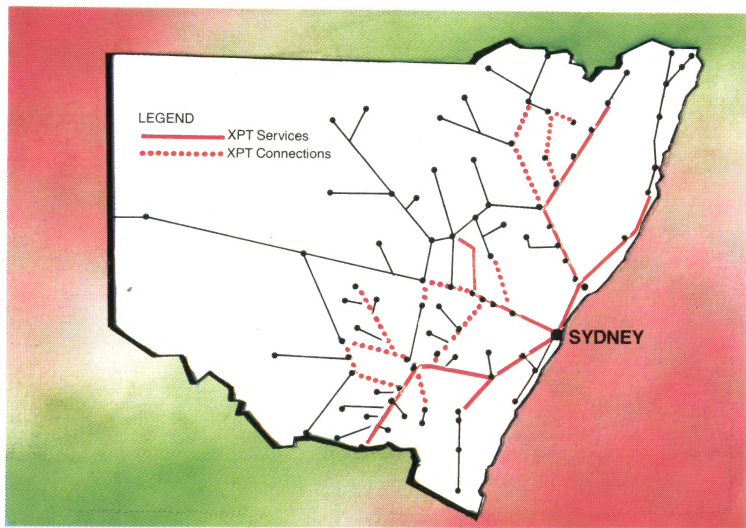
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Country rail travel in New South Wales is undergoing dramatic and spectacular improvement – thanks to the new generation Comeng XPT.

Introducing a new era in air conditioned comfort, passenger luxury and higher acceleration capabilities, power and speed, the high performance Comeng XPT is the equal to anything available *anywhere in the world*. Interior features include floor-to-window sill carpeting, panoramic heat deflecting windows, individual reading lights, adjustable reclining seats and many other modern passenger innovations that puts the Comeng XPT right up front with other modern forms of transport!

And this new generation train was designed, engineered and constructed by Commonwealth Engineering

for the State Rail Authority – convincing proof of the Company's ability to lead the way now – and in the future – for Australia's passenger and freight transport needs.

**Winner of the Chartered Institute of Transport Design Award 1981.**



A train  
of thought

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